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Vincent Brooks, In

THE

JOURNAL OF BOTANY,

BRITISH AND FOREIGN.

EDITED BY

BERTHOLD SEEMANN, Ph.D., F.L.S.,

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THE

JOURNAL OF BOTANY,

BRITISH AND FOREIGN.

ON *CAMELLIA JAPONICA*, VAR. *VARIEGATA*, A NEW VARIEGATED CAMELLIA.

BY BERTHOLD SEEMANN, PH.D., F.L.S.

(PLATE XLII.)

When publishing my monograph of the genera *Camellia* and *Thea* (Transactions of the Linnean Society, vol. xxii. p. 337), I stated that though we had thousands of representations of the various varieties of *Camellia Japonica*, we did not possess a single plate exhibiting the normal state of it, even Siebold and Zuccarini, in their 'Flora Japonica,' having figured a form with semi-double flowers. Mr. William Bull's establishment for the introduction of new and rare plants, has lately supplied me with what I have wished to see for years,—a *Camellia Japonica* with normal flowers,—and I have hastened to give a plate of it. In a horticultural point of view the plant is remarkable for its pretty variegated leaves, which, at a time when such foliage is fashionable, is sure to make it a great favourite. The plant was introduced from China by Mr. Robert Fortune, and is now flowering in Mr. Bull's nursery. It somewhat differs in the shape of the foliage from the normal type of *C. Japonica*, and if it was not for its glabrous, 3-celled ovary, might be suspected of being a new species.

Camellia Japonica, Linn., var. *variegata*, Seem. (Tab. XLII.), foliis ellipticis v. subovato-ellipticis acuminatis basi acutis, albo-marginatis,

subtus subaveniis; floribus inodoris; petalis 5 (roseis) rotundatis v. obovato-rotundatis, æstivatione quincuncialibus; staminibus pistilloque glabris; antheris ovatis acutis; ovario 3-loculari; stylis 3 connatis, apice liberis recurvis, intus stigmatosis; capsula ignota.—*Variegated Camellia*, Hortulanorum.

EXPLANATION OF PLATE XLII., representing *Camellia Japonica variegata*, from specimens kindly furnished by Mr. William Bull. Fig. 1. The two inner free stamens and part of the outer monadelphous series of stamens. 2. Pistil. 3 and 4. Sections of ovary, all slightly magnified.

UPON THE FLORA OF THE SHETLAND ISLES.

BY RALPH TATE, F.G.S., F.A.S.L., ETC.,
Secretary to the Shetland Anthropological Commission.

I. INTRODUCTION.

The only author who contributed to our knowledge of the plants of "Ultima Thule" was the late Mr. Thomas Edmonston, who published a "List of the Phanerogamic Plants, together with the Filices, Equisetaceæ, and Lycopodiaceæ," in the 'Magazine and Annals of Natural History,' p. 287 (1841). This list I have found very unsatisfactory as regards the habitats and frequency of occurrence of the species, so much at variance with my own observations, and in part with the author's own, as given in his subsequently-published 'Flora,' which, coupled with several errors of determination, have induced me to put this catalogue on one side; more especially as it has been superseded by his 'Flora,' which I have employed as a basis of operations. Still, at the same time, in this very list are species mentioned which have no place in the 'Flora,' and are truly indigenous; these are—*Galium Aparine*, *Myriophyllum* "*spicatum*," *Salix herbacea*; also, *Lotus corniculatus*, *Empetrum nigrum*, *Sparganium natans*, and *S. simplex*, mentioned only in the introduction to the Flora. Excepting the last species, I have found all the above. In addition, there are—*Veronica montana*, *Tormentilla reptans*, *Lychnis vespertina*, *Fumaria parviflora*, *Ulex Europæus*, *Conium maculatum*, *Pastinaca sativa*, *Polygonum Bistorta*, *Betula alba*, *Briza media*, *Arundo Calamagrostis*, *Bromus arvensis*, and *Lycopodium clavatum*. Some of these may have

been erroneously determined, as *Lycopodium clavatum*, which is *L. alpinum* (see Newman, 'Phytologist,' vol. i. p. 34, 1841), and hence not introduced into the Flora. I doubt not but that *Briza media, Polygonum Bistorta,* and *Conium maculatum* will hereafter be found to claim a place among the plants indigenous to Shetland. They are so to the Orkneys.

The second contribution to Shetland botany was also by Edmonston, and is entitled 'A Flora of Shetland, comprehending a List of the Flowering and Cryptogamic Plants,' etc. It was published in 1845. In this volume I have still to complain of an indefiniteness as to locality, of an erroneousness as to frequency of occurrence, at least as applicable to the whole archipelago. Such conspicuous plants as *Daucus Carota*, "abundant;" *Anthriscus vulgaris*, "abundant;" *Stellaria graminea*, "abundant," and others. Now, no one will admit that such *established* species could possibly have become extinct in so short a time; however, I did not succeed in finding them. Yet still I admit the possibility of the fault being mine, from the limited time I spent on the islands, about four weeks in the months of June and July, 1865; and that botanical investigation was not the object of my visit there, but only followed as opportunities permitted. I, however, spent nearly two weeks in the island of Unst, the principal field of Mr. Edmonston's labours, with which his name will ever be associated, as the discoverer of three new forms upon it. In the islands of Uyea, Yell, I spent in all a week; the island of Bressa, the districts of Northmavin, Tingwall, and Lerwick were fairly worked by me, each area yielding me some new species. Hurried and casual as was the nature of my exploration, yet I was enabled to make many corrigenda and addenda to the Flora; and as, also for some of the reasons above expressed, I am confident that a more extended research will be conferring a boon on botanical science by the addition of several species new to the Shetland list, and the authenticating of others, many of which are of a critical and interesting nature.

One inconvenience arising from the peculiar method of classification employed in the 'Shetland Flora,' apart from its inutility, is that some species are omitted in the general list, though mentioned in the preface; these are—*Lotus corniculatus*, p. xxiv.; *Alchemilla vulgaris, A. alpina*, p. xiii.; *Empetrum nigrum*, p. xvii.; *Sparganium*, p. xii.; *Dianthus deltoides, Glechoma hederacea*, and *Gnaphalium supinum*, p. xiii.

II. Catalogue of the Plants of the Shetlands.

The following lists of Shetland plants are rearrangements of Mr. Edmonston's Flora, with which I have incorporated the new and corrected species; these latter are printed in italics. The sequence of the species is as in Babington's 'Manual.' The species of Edmonston's Flora which I have authenticated have an asterisk prefixed, and, with but few exceptions, the species observed by me are now in the British Museum Herbarium. Additional localities of rare plants are added. The catalogue embraces two lists, the truly indigenous plants and the introduced plants, and such as concerning which there appears to be a doubt as to their correct determination. The altitudinal range is affixed to some species; thus, 70–100 (feet). The capitals O. and F. signify that the species occur in the Orkneys* or Feroes,† as the case may be. The letter I. is affixed to those Europo-American species which, though absent in the Feroes, occur in Iceland.‡

List of Indigenous Plants.

*Thalictrum alpinum. 0-1460; O., F.
*Ranunculus Ficaria. O., F.
*R. Flammula. O., F.
*R. Flammula, β reptans.
*R. acris. O., F.
*R. repens. O., F.
*Caltha palustris. O. F.
Trollius Europæus.
Nymphæa alba.
*Papaver dubium. O.
P. Rhœas. O.
Glaucium luteum.
*Fumaria officinalis. O.
*Arabis petræa. 50–80; F.
Cardamine hirsuta. O., F.
*C. pratensis. O., F.
*Sinapis arvensis. O.
*Draba incana. O., F.
D. incana, α. *contorta;* Springfields and Muckle Heog, Unst. 50–450.
D. incana, β. *confusa;* rocks, Muckle Heog. 400–450.
*Cochlearia officinalis. O., F.
*C. officinalis, β. alpina. 450.
C. Danica. O., F.
*Capsella Bursa-pastoris. O., F.
*Cakile maritima. O., F.
Raphanus Raphanistrum. O.
Viola palustris; bogs, Bressay, Unst, Yell, etc. O., F.
**V. Riviniana* (V. canina, *Edmonst.*). O., F.
*V. tricolor. O., F.
*V. arvensis.§
*Drosera rotundifolia. O., I.
D. Anglica. O., I.
*Parnassia palustris. O., I.
*Polygala vulgaris. O., F.
P. vulgaris, β. *depressa* (the more common).

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* H. C. Watson, "Florula Orcadensis," Journ. Bot., No. 13, January, 1864, p. 11.

† C. H. Martins, 'Végétation de l'Archipel des Féroe.'

‡ C. C. Babington, "List of Iceland Plants," Ann. and Mag. Nat. Hist. vol. xx. p. 30, July, 1847.

§ "This is a curious little plant. It may be the *V. vivariensis*, Jord.; its stipules are remarkably simple" (C. C. Babington).

Dianthus deltoides, "island of Vaila," Dr. Neill.
*Silene maritima. O., I.
*S. acaulis. 400–850; O., F.
*Lychnis Flos-cuculi. O., F.
*L. diurna. O., F.
*Sagina procumbens. O., F.
(S. saginoides, Edmonston, probably the pentandrous form of S. procumbens.)
*S. maritima. O.
S. subulata. I.
S. nodosa. Pastures bordering Tingwall Loch; North Unst (C. W. Peach); O., F.
*Honkeneja peploides. O., F.
Alsine verna. Gravelly ground, Ronas Hill; 600.
Cherleria sedoides.
*Arenaria Norvegica. 50–80; a single plant on the *Muckle Heog*, 430. I.
*Stellaria media. O., F.
S. graminea. O., F.
*S. uliginosa. O., F.
*Cerastium glomeratum. O., F.
*C. triviale. O., F.
C. semidecandrum. I., F.
*C. tetrandrum. O.
*C. latifolium (F.), β. Edmonstoni. 50–80.
Hypericum perforatum. O. F.
*H. pulchrum. O, F.
*Geranium molle. O.
*Linum catharticum. O., F.
*Trifolium pratense. O., I.
T. medium. O.
*T. repens. O., F.
Lotus corniculatus. Pastures, common; O., F.
*Anthyllis vulneraria. O.
*Vicia Cracca. O., F.
*Lathyrus pratensis. O., F.
*L. (maritimus. O., I.), β. acutifolius.
L. macrorrhizus. O.
*Spiræa Ulmaria. O., F.
Alchemilla vulgaris. Pastures bordering Tingwall Loch, 100; O., F.
A. alpina. Ronas Hill, 1000–1460; F.
A. arvensis. Fields, north and south side, Balta Voe, Unst; Tingwall; O.
Sibbaldia procumbens. F.
*Potentilla anserina. O., F.
*P. Tormentilla. O., F.
*Comarum palustre. O., F.
Fragaria vesca. O.
*Rubus saxatilis. *Springfield, Unst; Ronas Hill*, 50–1450; O., F.
*Rosa canina, α. *Luteliana*.* Leman (R. canina et R. tomentosa, Edmonston). O.; 5–200.
*Pyrus Aucuparia. O.; 200–300.
*Epilobium angustifolium. O., F.
E. montana. O., F.
*E. palustre. O., F.
Myriophyllum alterniflorum. Loch of Cliff and Uyea Sound, Unst; Littlesetter Loch, Burravoe, Yell; Tingwall Lochs, Mainland.
*Hippuris vulgaris. O., I.
Montia fontana, and β. *rivularis*. *Watery places throughout the islands*; O., F.
*Lepigonum marinum (*sensu stricto*). O.
*Spergula arvensis, α. *arvensis*. O., F.
*Sedum Rhodiola. O., F.
S. Anglicum.
Saxifraga oppositifolia. O., F.
*Hydrocotyle vulgaris. O., I.
Eryngium maritimum.
Bunium flexuosum. Voesgarth, Unst; O.
*Haloscias Scoticum. *Rocks, Hermaness, Unst; Ollaberry, Northmavin*; O., F.
*Angelica sylvestris. O., F.
*Heracleum Sphondylium. O.
Daucus Carota.
*Anthriscus sylvestris. O.
A. vulgaris.

* Determined by J. G. Baker, Esq.

Hedera Helix. O.
*Lonicera Periclymenum. O.
Asperula odorata.
Galium boreale. O., F.
G. Aparine. Strands at Balta Sound, Uyea Sound, and Haroldswick; Unst. O.
*G. verum. O., I.
*G. saxatile. O., F.
G. uliginosum. O., F.
*G. palustre. O., I.
Valerianella olitoria. Sandy banks and fields, Norwick, Unst; O.
*Scabiosa succisa. O., F.
*Tussilago Farfara. *Ollaberry ;* O., F.
*Bellis perennis. O., F.
*Solidago Virgaurea, γ. Cambrica. O.
*Achillea Ptarmica. O., F.
*A. millefolium. O., F.
Chrysanthemum Leucanthemum.
C. segetum. O.
*Matricaria inodora. O., F.
*M. inodora, β. maritima. O., F.
*Artemisia vulgaris.
A. Absinthium.
*Tanacetum vulgare. O., F.
*Gnaphalium uliginosum. *Ollaberry ;* O., I.
G. Norvegicum. Roadsides about Tingwall; about 100 feet.
G. supinum. Ronas Hill (Edmonston). O. ?, F.
*Antenaria dioica. 0–1400 ; O.
*Senecio vulgaris. O., F.
*S. Jacobæa. O.
*S. aquaticus. O.
*Saussurea alpina. 800–1400 ; O.
Arctium (Lappa). O.
*Centaurea nigra. O.
C. cyanus. O.
Onopordum Acanthium.
*Carduus lanceolatus. O., F.
*C. arvensis. O., I.
β. setosus ; sand dunes and sandy fields, Ness. N. Yell.*
*C. palustris. O., F.
*Apargia autumnalis. O., F.
*Leontodon Taraxacum. O., F.
*L. palustre. F.
Sonchus oleraceus. O.
*S. asper.
S. arvensis.
Hieracium crocatum. Loch of Cliff and Burrafirth, Unst ; 20.
H. vulgatum. Burrafirth ; 20.
H. floccosum. Rocks, Ronas Voe ; 200
Lobelia Dortmanna. Littlesetter Loch, Burravoe, Yell; Loch to north-west of Ronas Hill; Tingwall Loch. 0–400 ; O.
*Jasione montana. O.
Campanula rotundifolia. F.
*Arctostaphylos alpina. 200–1800; O., I.
*A. Uva-ursi. 200–600 ; O., I.
*Calluna vulgaris. O., F.
*Erica tetralix. O.
*E. cinerea. O., F.
*Azalea procumbens. O., F.
*Vaccinium Myrtillus. O., F.
*V. uliginosum. *Ronas Hill,* 600; O., F.
Pyrola media. F.
Erythræa Centaurium.
E. littoralis ?
Gentiana Amarella. O.
*G. campestris. O., F.
*Menyanthes trifoliata. O., F.
*Lycopsis arvensis. O.
*Mertensia maritima. *Bardister Voe, Northmavin ; Hillswick* (Adam White. O., F.
**Myosotis repens* (*M. palustris,* Edm., F.). Bogs, Bressay, Haroldswick, etc.
*M. cæspitosa. O.
*M. arvensis. O., F.
*M. collina. F.
*M. versicolor. O.
*Pedicularis palustris. O., F.
*P. sylvatica. O., F.
*Rhinanthus Crista-galli. O., F.

* The leaves are more entire than in any *setosus* that I have seen ; it is an interesting plant. (C. C. B.)

R. major.
*Euphrasia officinalis (*var.*). O., F.
Veronica scutellata. Marsh behind the Manse, Bressay; O.
*V. Anagallis. O. F.
*V. Beccabunga. O., F.
V. Chamædrys. O.
*V. officinalis. O., F.
*V. serpyllifolia. O. F.
**V. arvensis.* *Fields, Scarpoe, Unst; Lerwick* (J. Gatherer). O.
*V. agrestis. O.
*V. hederifolia. O.
*Thymus Serpyllum. O., F.
*Prunella vulgaris. O., F.
Nepeta Cataria.
N. Glechoma. Sand Voe (Edmonston); O.
*Lamium intermedium. *Norwick; Skaa, Unst;* O.
*L. incisum. *Lerwick.*
*L. purpureum. O., F.
*Galeopsis Tetrahit. O., F.
Stachys sylvatica. O., I.
*S. palustris. O.
*S. ambigua. O.
Ajuga reptans. O.
*Pinguicula vulgaris. O., F.
Utricularia vulgaris.
*Primula vulgaris. O., F.
Anagallis tenella. O., F.
Trientalis Europæa.
*Glaux maritima. O., I.
Statice Limonium.
*Armeria maritima. O., F.
*Plantago Coronopus. O., F.
*P. maritima, *inland rocks, as Muckle Heog*, 450; *Ronas Hill*, 1476, O., F.
*P. lanceolata. O., F.
*P. major. O., F.
*Littorella lacustris, O., F.
*Suæda maritima. O.
*Chenopodium album. O., F.
Beta maritima. O.
Salicornia herbacea. O.
*Atriplex angustifolia. O.
A. deltoidea.
*A. hastata. O., F.
A. Babingtoni (A. glabriuscula et A. rosea. Edmonst.). O., F.
Rumex conglomeratus. O., F.
R. obtusifolius. Unst, Ollaberry, O.
*R. crispus. O., F.
*R. aquaticus. O., F.
*R. Acetosa. O., F.
*R. Acetosella. O., F.
*Polygonum viviparum. *Island of Balta* (C. W. Peach), *Island of Uyea.* O., 15. *Ronas Hill*, 1476. O., F.
*P. amphibium. O., I.
*P. Persicaria. O., F.
P. Hydropiper. O., F.
*P. aviculare. O., F.
P. aviculare, *var. littorale?* Sandy fields, Bressa; Norwick, Unst. *var.** *with broad leaves, seashore, Burrafirth.*
P. Raii.
Empetrum nigrum. Very common in Unst; Ronas Hill; etc. 0–938. O., F.
*Euphorbia Helioscopia. O.
*Callitriche platycarpa, β. stagnalis.
C. verna. O., F.
**C. hamulata. Bressay, Unst*, etc.
*C. autumnalis. O., F.
*Urtica urens. O.
*U. dioica. O., F.
*Salix cinerea, β. aquatica. O.
*S. aurita. O.
S. repens. O.
α. repens.
ε. incubacea.
ζ. argentea. *Ollaberry, Northmavin.*
S. herbacea. Saxaford Hill, Unst, 938; *Ronas Hill*, 1000–1470. O., F.
Populus nigra (probably P. tremula. O.)
Juniperus communis. O., F.
J. nana. O.
*Orchis mascula. O., F.

* "Much like the Iceland form, but not distinct from *P. aviculare.*" (C.C.B.).

*O. maculata. O., F.
*O. latifolia. O., F.
Gymnadenia conopsea. O.
G. albida. O. F.
*Habenaria viridis. F.
Listera cordata. Among heath, Ronas Hill; hills about Lerwick; Scatsta (A. White). O.
*Iris Pseudacorus. O., F.
*Scilla verna. O., F.
*Narthecium ossifragum. O., F.
*Juncus effusus. O., F.
J. conglomeratus. O., F.
J. triglumis. F.
J. acutiflorus. O.
*J. lamprocarpus. O.
*J. supinus. O., F.
*J. squarrosus. O., F.
J. compressus.
*J. Gerardi. O.
*J. bufonius. O., F.
*Luzula sylvatica, 300–938. O., F.
L. pilosa. O., F.
L. campestris. Natural pastures, Bressay, etc.; bogs, Unst. O.
L. multiflora. O., F.
*Triglochin maritimum. O., F.
*T. palustre. O., F.
Sparganium natans. Loch of Cliff, Burrafirth, Unst. O., F.
*Potamogeton natans. Stream flowing from Loch of Cliff, Unst. O., F.
P. polygonifolius. Streams, marshes near Manse, Bressay; boggy place by stream, Skaa, Unst (C.W. Peach). O.
*P. heterophyllus. *Tingwall Lochs.*
P. lucens, O., F.
P. perfoliatus (without doubt, P. crispus, of Edmonst.). *Norwick; Loch of Cliff; Ness; Burravoe; Tingwall Loch.* O., F.
P. filiformis (P. pectinatus, Edmondson), *Uyea Sound; Unst; Kirk Loch, Ness, N. Yell.* O.
Ruppia maritima. O.
Zostera marina. F.
*Schœnus nigricans. *Scarpoe, Unst; Island of Uyea.* O.
Rhynchospora alba.
*Eleocharis palustris. O., F.
*Scirpus lacustris (or, S. Tabernæmontani). O., I.
*S. cæspitosus. O., F.
Blysmus rufus. O.
*Eriophorum vaginatum. O., F.
*E. angustifolium. O., F.
*E. *var.* polystachion. F.
*Carex dioica. O.
*C. pulicaris. O., F.
C. incurva. F.
*C. arenaria. O., F.
C. stellulata. Marshes, frequent throughout the islands. O., F.
*C. ovalis. *North banks, Island of Uyea; Burravoe; West Yell; near Tingwallmanse.* I.
*C. rigida. 800–1400.
C. pilulifera. Scarpoe, Unst; Island of Uyea.
*C. vulgaris. O., F.
C. panicea. Wet pastures, Lerwick; Bressay; Unst; Out-Skerries (C. W. Peach). O., F.
C. capillaris (requires confirmation).
C. præcox. O.
C. glauca. O.
*C. flava. O., F.
C. Œderi.
**C. distans* (*C. fulva = C. speirostachya, Edmonston*). O.
*C. binervis. O.
*C. ampullacea. O., I.
*Phalaris arundinacea. O., F.
*Alopecurus pratensis. F.
*A. geniculatus. O., F.
*Anthoxanthum odoratum. O., F.
*Nardus stricta. O., F.
Phragmites communis. O., I.
Psamma arenaria. O.
Agrostis canina. O., F.
*A. vulgaris. O., F.
*A. alba. O., F.

*Holcus lanatus. O., F.
H. mollis. F.
*Aira cæspitosa. O., F.
*A. flexuosa. O., F.
A. caryophyllea. O.
*A. præcox. O., I.
Avena fatua. O.
*A. strigosa. O.
*Arrhenatherum avenaceum. O.
A. avenaceum, β. bulbosum.
*Triodia decumbens. O.
Melica uniflora (probably mistaken for Briza media).
*Molinia cærulea. O., F.
*Poa annua. O., F.
*P. trivialis. O., F.
*P. pratensis. O., I.
*Glyceria fluitans. O., F.
*Sclerochloa maritima. O., I.
S. distans. South side of Balta Voe, Unst.
Catabrosa aquatica. O., F.
——— *β. minor. Sandy shore of Kirk Loch, Ness, N. Yell.*
*Cynosurus cristatus. O.
*Dactylis glomerata. O., F.
*Festuca ovina. O., F.
*F. duriuscula *rubra* (F. Emond.). O., F.
F. pratensis. O., F.
*Serrafalcus mollis. O.
*Triticum repens. O., F.
*T. repens, var. littoreum.
*T. junceum. O.
*Elymus arenarius. O., F.
*Lolium perenne. O.
*Equisetum arvense. O. F.,
*E. sylvaticum. *Skaa, Burrafirth, Unst; Quayfirth, Northmavin.* O., F.
*E. limosum. O., F.
*E. palustre. O., F.
*Polypodium vulgare. O., F.
P. ? Phegopteris. O., F.
Lastrea Oreopteris.
L. dilatata (= ? L. Filix-mas, Edmonst.). *About Lerwick; Bressay; Saxaford, Burrafirth, etc., Unst, Ollaberry.* O.
*Athyrium Felix-fœmina. O.
Asplenium Adiantum-nigrum. Harold's Grave, and Muckle Heog, Unst; 380–460. O.
A. viride. Muckle Heog. 400.
A. marinum. Sea-cave, Burrafirth, Unst (Mr. C. W. Peach, 1864). O.
Scolopendrium vulgare. O.
*Blechnum boreale. O., F.
*Pteris aquilina. O.
*Hymenophyllum Wilsoni. *Burrafirth, Unst* (Mr. C. W. Peach, 1864). O., F.
Osmunda regalis. O.
*Botrychium Lunaria. O., F.
Ophioglossum vulgatum. O., I.
Lycopodium *clavatum. Peaty heath, west of Ollaberry.* O., F.
*L. alpinum. O., F.
*L. Selago. O., F.
*L. selaginoides. O., F.
Chara aspera. Tingwall Lochs. O., F.
C. hispida. Lochs at Uyea Sound, Unst.* O.

2. *List of Introduced and Doubtful Plants.*

Raphanus maritimus, "should be confirmed on more experienced authority than the late youthful author, of the Shetland Flora." Watson, 'Cybele,' p. 167.
Fumaria Vaillantii. Introduced.
**Geranium pratense.* Gardens, Unst; probably may be found wild in the island. O., F.
G. phæum, "perhaps introduced." Edmonston.
Lychnis Githago. In cultivated lands at Tingwall. O.
Linum usitatissimum. Introduced.

* "A very remarkable and interesting form, apparently the δ. *brachyphylla*, A. Braun." (C. C. B.)

*Ulex Europæus, and *Cratægus Oxyacantha. Well known to have been planted at Tingwall.

*Vicia sativa. Cultivated at Tingwall. O.

**Sedum Fabaria*. (? = S. Telephium. Edmonston.) *Gardens, Haroldswick, Unst*, etc.

*Carum Carui. Probably planted originally, but now apparently wild.

Anthemis Cotula. Tingwall, a very suspicious locality.

Petasites vulgaris. Tussilago Farfara occurs in the station given by Edmonston for this species; I suspect some accidental error has crept in here.

Mentha viridis. "Likely not indigenous," Edmonst.

Plantago media. Introduced as in the Orkneys and Feroes.

*Endymion nutans. A garden plant a Balta Sound and Springfield, Unst.

(Sparganium ramosum. O.; S. simplex.)

Potamogeton lanceolatus, probably a state of *P. heterophyllus*.

*Phleum pratense. "Probably introduced." O., F. (*Serrafalcus mollis*, *Alopecurus pratensis*, and even *Dactylis* excite a suspicion in my mind as to their being truly indigenous; I have not seen them in natural pastures, but only in prepared grass lands.)

Poa compressa. An error?

Cynosurus echinatus. Introduced or erroneously determined.

Serrafalcus commutatus. Introduced?

Lolium temulentum. ? = L. italicum. Introduced.

**Avena sativa*. Wayside, Balta, Unst.

Lastrea Thelypteris. An error?

III. General Botanical Features.

The facies of the flora of the Shetlands is very striking; especially are the land slopes bordering the sea singularly rich in plants more abundant in petals than leaves. This profusion of blossoms is in keeping with the operation of a law, that in proportion as the habitat proves ungenial (threatening the life of the individual, dwarfing the stem), so the flowers increase in number and proportionately in size; and thus the whole plant becomes more fruitful in behalf of its kind.

But a few plants only are found differing in this respect; most markedly among such is *Bunium flexuosum*, which attains a height of from 2½ to 3 feet. In many sheltered situations among the sea cliffs the vegetation is very luxuriant, and presents no essential differences from a like vegetation in the south of England.

This tendency to produce an excessive development of floral organs very generally gives rise to abnormality. Viviparous states of *Festuca ovina* and *Lolium perenne* are very common; polypetalous flowers with petaloid stamens have occurred to me in *Erica Tetralix*, the stem-leaves of *Cardamine pratensis* transformed into flowering racemes; the uppermost bract of *Caltha palustris* petaloid; in Mr. C. W. Peach's collection is *Leontodon Taraxacum*, its scape bearing a

leaf at the distance of one-eighth of its length from the apex; and many others of the like nature were noticed by me.

The maritime vegetation presents few characteristics. The dominant species of the natural pastures are—*Festuca*, *Anthoxanthum*, *Lotus*, *Scilla*, *Thymus*, *Polygala*, *Ranunculus repens*, *Rhinanthus*, *Bellis*, *Prunella*, *Galium saxatile*, with *Orchis maculata*, *Habenaria viridis*; the marshes dispersed among the pastures have for their characteristics, *Myosotis repens*, *M. cæspitosa*, *Menyanthes*, *Pedicularis palustris*, *Stellaria uliginosa*, *Iris*, *Juncaceæ*, and *Carices*.

The common agrestal plants are, *Viola tricolor*, *Spergula*, *Cerastiums*, *Lamium purpureum*, *Galeopsis Tetrahit*, *Lycopsis*, *Veronica agrestis*, *V. hederifolia*, and *Myosotis*.

Papaver dubium, *Viola arvensis*, *Geranium molle*, *Valerianella*, *Fumaria officinalis*, and *Lamium intermedium* are confined to sandy soil.

The plants of the moorlands and bogs are such as are usually met with throughout Great Britain.

Though it is possible, when the distribution of plants in these isles is viewed as a whole, to distinguish vertical zones of vegetation, yet a very large number of the species, elsewhere well defined in their range relatively to others, in the Shetlands encroach and modify the vegetation of a lower or higher zone, as almost to set aside any attempt to utilize, at least for a limited district, the vertical range of the species. Thus, a few alpine plants may be here recognized as occurring at much lower levels than elsewhere in Britain:—

Thalictrum alpinum, 0–1460 feet; *Arabis petræa*, 70 feet; *Draba incana*, 70–460 feet; *Gnaphalium Norvegicum*, 100 feet; *Polygonum viviparum*, 0–1476 feet; *Salix herbacea*, 900–1470 feet; *Empetrum nigrum*, 0–1000 feet; *Saussurea alpina*, 800–1400 feet; *Carex rigida*, 800–1400 feet.

However, the *general vertical distribution* of the plants seems to be as follows:—

1. The Superagrarian Zone of vegetation, here extending from the sea-shore up to an average elevation of about 100 feet.

2. The Infer- and Mid-Arctic Land Zones, not clearly separable; the Infer-Arctic extending to at least 600 feet. These zones embrace the remaining surface, excepting the summit of Ronas Hill, which is characterized by a Super-Arctic vegetation.

3. The Super-Arctic Zone commences at an elevation of about 800

feet on Ronas Hill, and its flora is represented by *Azalea procumbens, Carex rigida, Saussurea alpina, Alchemilla alpina, Salix herbacea, Sibbaldia procumbens.*

As regards the geological distribution of the plants little can be said, for though the lithological characters of the rocks are so varied, and though the rocks appear at the surface, and thus present conditions favourable for the modification of the flora, yet little influence is exerted upon the vegetation. That of the Serpentine and Euphotide rocks presents some prominent features; peat, which is generally so abundant on the gneiss, mica, slate, granite, and sandstone, is almost absent on the Serpentine and Euphotide; *Arabis petræa, Draba incana, Arenaria Norvegica, Cerastium latifolium, Anthyllis vulneraria* are restricted to them.

The granite of Ronas Hill yields many peculiar plants, but they owe their presence to the superior altitude (1476 feet) of the hill on which they occur as subalpine forms of vegetation, and cannot be regarded as truly granite-loving species.

The plants restricted to a sandy soil have been already given.

IV. Comparison of the Flora of Shetland with that of the Orkneys and the Feroes.

The Shetland Islands occupy a geographical position intermediate between the Orkneys and the Feroes, and strikingly contrast with them as regards geological structure. Thus the dominant rocks of the median archipelago belong to the metamorphic series and the Old Red Sandstone formation, the former being represented by serpentine, mica slate, gneiss, and granite; the latter by grits and sandstone. Little or no drift-matter encumbers the solid rocks. Whilst, on the one hand, the rock-formation of the Feroes is basalt, said to be comparatively poor in species, on the other, the rocks of the Orkneys all belonging to the sedimentary series, are sandstones, grits, and argillaceous sandstones. It is therefore a very interesting subject of inquiry, as to the botanical relation existing between these three groups of islands.

No very marked differences in climate exist between the Feroes, Shetlands, and Orkneys; the mean annual temperature of the most northern group of islands is 45°·16, being very little below that of the Orkneys, which is 46°·204, whilst it exceeds that of the Shetlands by 0°·434. Though there is such a similarity in climate between the

Feroes and the Shetlands, yet the former presents upon its mountain-sides all the gradations from a north temperate clime to an arctic one. This will account for the greater predominance of boreal species in the Feroes, the flora of which is certainly an appendix to the Icelandic group; whilst that of the Shetlands appertains to the Scottish flora.

The flora of Feroe numbers 292 species, 198 of which form part of the Shetland vegetation; of these—

1. Appertaining neither to an arctic nor to an alpine-boreal type of vegetation. The following are common to Feroe and Orkney, and are certainly desiderata to the Shetland list. These are:—*Nasturtium officinale*, *Oxalis Acetosella*, *Geum rivale*, *Epilobium tetragonum*, *Myriophyllum verticillatum?*, *Hieracium Pilosella*, *H. murorum*, *Galeopsis Ladanum*, *Salix caprea*, *Potamogeton pusillus*, *Scirpus fluitans*, *Lastrea Filix-mas*, *Cystopteris fragilis*, *Asplenium Trichomanes*.

2. Appertaining to an alpine-boreal type. The following, also common to the Orkneys and Feroes, are not so decidedly desiderata to the Shetland list. These are:—*Draba verna*, *Geranium sylvaticum*, *Dryas octopetala*, *Saxifraga hypnoides*, *Pinguicula alpina*, *Oxyria reniformis*, *Salix arbuscula*, *S. glauca*. Further:—

3. Appertaining neither to an arctic nor to an alpine-boreal type. The following are absent in the Shetlands and Orkneys, and are certainly desiderata to the lists of these two botanical districts. These are:—*Ranunculus auricomus*, *Cardamine amara*, *C. impatiens*, *Cochlearia Anglica*, *Brassica campestris*, *Hypericum dubium*, *Geranium pratense* (probably native in Shetland), *Potentilla verna*, *Epilobium roseum*, *Ceratophyllum demersum*, *Carduus acanthoides*, *Apargia Taraxaci*, *Vaccinum Vitis-Idæa*, *Pyrola minor*, *Myosotis palustris*, *Limosella aquatica*, *Mentha arvensis*, *Orchis Morio*, *Scirpus maritimus*, *Eleocharis acicularis*, *E. pauciflorus*, *Carex pallescens*, *C. stricta*, *C. acuta*, *C. riparia*, *Lemna polyrrhiza*, *Isoetes lacustris*, *Equisetum hyemale*.

Then again there are those—

4. Which are alpine-boreal, existing at the same time in boreal Europe and on the Scottish mountains and the Swiss Alps, but not known in Orkney and Shetland, as *Draba rupestris*,* *Cerastium alpinum*, *C. trigynum*, *Epilobium alpinum*, *Alchemilla conjuncta*, *Sedum villosum*, *Saxifraga stellaris*, *S. nivalis*, *S. rivularis*, *S. cæspitosa*, *Cornus succisa*, *Hieracium alpinum*, *H. Lawsoni*, *Bartsia alpina*, *Veronica alpina*, *V. saxatilis*, *Salix lanata*, *Juncus trifidus*, *J. biglumis*, *Luzula spicata*,

Kobresia scirpina, Carex atrata, Aira alpina, Poa alpina, P. cæsia, Polytrichum Lonchitis.

Others not British, as *Ranunculus glacialis, R. montanus, Arabis alpina, Lepidium alpinum, Alchemilla fissa, Epilobium nutans, Orchis sambucina, Carex Lyngbyei.*

And, finally, those that are eminently boreal:—*Ranunculus nivalis, Papaver nudicaule, Draba Lapponica, Saxifraga tricuspidata, S. palmata, Angelica Archangelica, Kœnigia Islandica.*

The flora of the Orkneys numbers 390 species, 312 of which are indigenous to the Shetlands; there are, therefore, 78 Orcadian species not known in Ultima Thule; 22 of these, given in lists No. 1 and No. 2, are common to the Orkneys and the Feroes, and the remainder thus attain their northern limit of distribution, through the chain of the isles of Great Britain, in Orcadia. By reference to the catalogue of Shetland plants, 60 indigenous species and 11 varieties are indicated as unknown in the Orkneys, though present in the more northern province. Of the varieties, *Cerastium latifolium, β. Edmonstoni*, and *Lathyrus maritimus, β. acutifolius*, are peculiar to Unst. It is to be noted that the former species belongs to the alpine-boreal type; and the variety has been referred to a no less eminent alpine-boreal species, *C. glaciale.*

The flora of Shetland, in its present revised form, numbers 364 indigenous species, and 14 marked indigenous varieties. With the following exceptions, all are generally distributed throughout Central Europe, and are found in Great Britain. The exceptions are *Cerastium Edmonstoni, Lathyrus acutifolius*, which are restricted to the island of Unst; *Arenaria Norvegica*, also confined to that island (the most northern and eastern of the Shetland group), but elsewhere only known in Scandinavia. The only boreal plants are *Cherleria sedoides, Arenaria Norvegica*, and *Saussurea alpina; Geranium phæum* is doubtfully native. Even alpine forms are poorly represented in these isles, and the majority of these are confined to Ronas Hill. Of the six Saxifrages, *S. stellaris, S. nivalis, S. rivularis, S. cæspitosa, S. oppositifolia*, and *S. hypnoides*, which range from Scotland to the Feroes, Iceland, and Greenland, only *S. oppositifolia* is a Shetland plant (yet occurring at the opposite extremities of the mainland).

I will conclude this paper by a correction rendered necessary by a better acquaintance with the floras of the Shetlands and Orkneys, of

what is now an error in the Ann. and Mag. of Nat. Hist. vol. viii. p. 542, where Professors Balfour and Babington state, "The Ferns of the Shetlands are less numerous than those of Iceland or Feroe; while those of the Long Island, Hebrides, exceed the Feroe species by 4, and are exactly equal to the number found in Iceland." The census of the Filices is now—Orkney, 17; Shetland, 15 or 16; Hebrides and Iceland, 14; and Feroe, 10.

The Shetland Isles possess an extinct flora, the most characteristic species of which is *Betula alba;* but a consideration of the agents which have brought about the extinction of such is not quite in keeping with the descriptive character of the present paper, and may possibly appear as a separate communication.

In conclusion, I would acknowledge the assistance rendered me by Professor C. C. Babington, in determining *Gnaphalium Norvegicum*, the *Hieracia*, and *Chara aspera*, and also for his critical notes, which are appended to the species they refer to. I have also to thank Messrs. C. W. Peach, Adam White, F.L.S., and J. Gatherer, for submitting to my examination many Shetland plants, collected by him in 1864, from which I have been enabled to add one new Fern, and several additional localities of interesting species.

[A *Plantago*, collected by Mr. Tate, was thought to be *P. alpina*, but, on closer examination, it turns out to be some broad-leaved form of *P. maritima*, or, at all events, it is better considered so until more evidence has been adduced.—Editor.]

NOTE ON THE FERN GENUS *BRAINEA*.

By John Smith, Esq.

I beg to make a few remarks in reference to Dr. Hance's article on the name and affinity of *Brainea insignis* given in the Journal of Botany, Vol. III. p. 341. First, as regards the name. In 1851, Mr. C. J. Braine, on his return from Hongkong, brought with him a collection of living plants, which he presented to the Royal Botanic Garden at Kew; amongst them were several epiphytal Orchids artificially attached to stems of Tree-Ferns about a foot or 18 inches in length, and about a foot in circumference. The fronds of these stems were closely cut

away, and their apical axis was gone; they were considered to be dead, and appeared to be those of *Lomaria Boryana*, *Sadleria cyathoides*, or some analogous species. They were placed with the Orchids on them in the hothouse, and in about two years after, I was much surprised to find that two of them had pushed out a lateral bud, which in due time were transferred into pots, and ultimately became fine plants. About the same time, the late Sir William Hooker had received specimens of this Fern from Sir John Bowring, and, finding it to be the type of a new genus, he dedicated it to that gentleman, (Kew Miscellany of 1853,) under the name of *Bowringia insignis*, giving Sir John Bowring, instead of Mr. Braine, the credit of having introduced the living plant to Kew. Some time after, whilst engaged in drawing up an enumeration of the Ferns of Hongkong, for Seemann's 'Botany of the Voyage of the Herald,' I found that Mr. Bentham had previously applied the name *Bowringia* to a Leguminous plant. Bringing these facts to the notice of Sir William Hooker, I proposed to re-name the plant *Brainea*, and this name I adopted in the 'Botany of the Herald,' and also in my 'Catalogue of Cultivated Ferns,' in 1857, with my name affixed as the authority.

The next point I have to notice is Dr. Hance's opinion of the affinity. After showing the views of Pteridologists on that point, he proceeds to say, "I certainly think *Gymnogrammeæ* the true and natural station for *Brainea*," and "that it would be difficult to produce a more perfect instance of parallelism between two tribes (*Lomarieæ* and *Gymnogrammeæ*) than that shown in the following diagram in which the opposite genera exactly correspond:" that is to say, that *Blechnum* corresponds with *Gymnogramme*, § *Coniogramme*, *Sadleria* with *Brainea*, and *Woodwardia* with *Gymnogramme* § *Dictyogramme*. Now, I admit that *Sadleria* and *Brainea* are a perfect instance of parallelism, but I must confess, in all my study of the relationship of Ferns it never came into my mind that there was any connection between *Blechnum* and *Gymnogramme*, or *Woodwardia* and *Dictyogramme*. The reason which has led *Brainea* to be placed in alliance with *Gymnogramme* seems to rest solely on the character of the *sori*, but by too strict adhering to that organ Sir William Hooker was led to place such a very heterogeneous mass of species under *Gymnogramme*, that even *Brainea* might have been included as a species of that genus. If the Darwinian theory of the origin of what is called species from antecedent species be admitted

as a guide to assist in determining affinity, then the Cycad-looking stem of *Brainea* should be compared with that of humble Gymnograms. But, surely, many forms have yet to be discovered before *Brainea* can be said to have originated from Gymnograms, or the latter from *Brainea*. On the other hand, it is easy to see that *Brainea, Sadleria, Lomaria*, and the whole of *Blechnum*, are of the same lineage, and quite unconnected with *Gymnogramme*. The absence of an indusium in *Brainea* does not reason against this view, being analogous to the want of indusiæ in closely-allied species of *Phegopteridia*.

Dr. Hance also brings to notice the relationship between *Polypodium* and *Acrostichum*, on which, at some future time, I may offer a few remarks.

ANALYSIS OF CHINCHONA BARK AND LEAVES, RECEIVED JUNE 21st, 1865.

From W. G. M'Ivor, Esq., Superintendent of the Government Chinchona Plantations, Ootacamund, to C. G. Master, Esq., Secretary to the Government Revenue Department.

Ootacamund, 3rd May, 1865.

Sir,—I have the honour to forward by baughy a box containing a further supply of Chinchona bark, as per memorandum annexed, for transmission to the Right Honourable the Secretary of State for India, in order that it may be submitted to Mr. Howard for analysis and report. The bark now forwarded was removed from the plants in the early part of April last, or as the sap begins to rise, as at this season the bark separates freely from the wood. Specimens Nos. 2 and 3 are renewed barks; these attain extraordinary thickness in a short period of growth; and if they contain a proportionate quantity of alkaloids, this system of treating the plants appears to offer greater advantages than the other methods proposed. I may observe that further observation seems to establish that this system of removing strips of bark from the stems of the plants can be practised without injury, provided the wound is instantly covered with damp moss; inattention to covering the wounds having produced the bad effects detailed in my letter of the 17th March, 1864.

Memorandum.

Chinchona succirubra.—No. 1. Bark of three years and five months' growth, thickened by the application of moss. No. 2. Renewed bark of one year and five months' growth, being reproduced on the same portion of a stem which produced the bark given to Doctor de Vrij in November, 1863, and from which that gentleman obtained 8·409 per cent. of alkaloid. No. 3. Renewed bark of one year's growth, and gathered from portions of the stem which yielded No. 1 bark, submitted to Mr. Howard in the spring of 1864. No. 4. Bark of two years and five months' growth, not thickened by the application of moss.

Chinchona Calisaya.—No. 5. Bark of two years and five months' growth.

Chinchona Condaminea.—No. 6. Bark of one year and seven months' growth.

Chinchona micrantha.—No. 7. Bark of two years and five months' growth, thickened by the application of moss. No. 8. Ditto of same growth, but not thickened by the application of moss.

(Signed) W. G. M'Ivor,
Superintendent of the Government Chinchona Plantations.

Report of an Analysis of the Fourth Remittance of Bark from India.

From J. E. Howard, Esq., F.L.S., to the Under Secretary of State for India, August 1st, 1865.

Sir,—I have the honour to report that I received, and have during the past month devoted much careful attention to the analysis of eight specimens of bark, referred to in a letter from Madras, dated 3rd May, 1865. The whole of the samples were in excellent condition, showing the care and skill bestowed on their cultivation. They contrasted most favourably with specimens from South America, of bark used at the present moment in the extraction of quinine. The mode of analysis I have followed, in the present instance, is that which is employed to ascertain the *commercial value,* which rests almost entirely with the *crystallizable sulphates,* with perhaps some slight loss of the residuary product. The results will compare well with those given in Delondre's 'Quinologie.'

No. 1 gave of crystallized sulphate, per 100 parts . . . . 6·00
of alkaloid soluble in ether (sp. gr. ·720) . . . . 0·94
of alkaloid insoluble in the above (therefore Chinchonine) . 1·06
Mem.—The sulphate refined into white sulphate of quinine in appearance, but this did not stand the test used for commercial sulphate of quinine.

No. 2 gave of crystallized sulphate . . . . 5·00
of alkaloid soluble in ether . . . . 0·90
of alkaloid insoluble in ether. (Chinchonine) . . . . . . 1·80
Mem.—Refined as above.

No. 3 gave of crystallized sulphate . . . . 2·72
of alkaloids soluble in *alcohol* . . . . 7·00
Mem.—As I could only submit to examination 165 grains of the bark, the above result must be taken with reserve.

No. 4 gave of crystallized sulphate . . . . 2·43
of alkaloid soluble in ether . . . . 2·03
of alkaloid insoluble in ether. (Chinchonine) . . . . . . 0·60
Mem.—This specimen gave a product not refining quite so well as No. 1.

No. 5 gave of crystallized sulphate . . . . 0·70
of alkaloid soluble in ether . . . . 0·10
of alkaloid soluble in ether, but crystallized by evaporation . 0·26
of alkaloid insoluble in ether. (Chinchonine) . . . . . a trace.
Mem.—This sulphate did not stand the ether test.

No. 6 gave of crystallized sulphate . . . . 0·90
of alkaloid soluble in ether . . . . 0·60
of alkaloid insoluble in ether. (Chinchonine) . . . . . a trace.
Mem.—The tests showed Quinine and Chinchonidine.

No. 7 gave of crystallized sulphate . . . . 5·82
of alkaloid soluble in ether. (Aricine) . . . . 0·29
of alkaloid insoluble in ether. (Chinchonine) . . . . . . 0·39
Mem.—This sulphate is that of *commercial* Quinidine, and contains probably no Quinine.

No. 8 gave of crystallized sulphate . . . . 1·26
of alkaloid soluble in ether . . . . 0·60
of alkaloid insoluble in ether. (Chinchonine) . . . . . a trace.
Mem.—The product similar to that of No. 7.

I beg to direct special attention to the remark, that the fine white crystallized *Sulphate of Quinine* (apparently) made from the bark of *C. succirubra* will not stand the test which is employed to distinguish the pure article in commerce. The cause of this I stated in my first report, viz. that "the crystallizations obtained are mixed with some Sulphate of Chinchonidine, which is commercially (but not medicinally) a disadvantage, and one which always attends the products of red bark." It is, of course, possible to separate the Chinchonidine, but then this

must very seriously diminish the percentage of six per cent. I obtained from this gross product little more than four per cent. refined in the first instance (though more subsequently), and of this I ascertained about ten per cent. as Chinchonidine. This difficulty must be looked steadily in the face, and I would suggest that it may be obviated, either by a change being wrought in the opinion of the medical world as to the value of Chinchonidine as a medicine, or by the plant being encouraged to produce Quinine instead of Chinchonidine.

The first might be, very probably, the result of a commission of inquiry composed of competent medical practitioners. I may mention that the late Dr. Royle entered zealously, at my suggestion, into the question, and satisfied himself by experiment as to the value of Chinchonidine, but I am not aware that he left any written record of the result he attained. My own experiments confirm this view of the question, and I have shown* that this alkaloid (which must not be confounded with Chinchonine) must have constituted (in whole or in part) the therapeutic agent in the cure of the Countess of Chinchon, as also that it was the alkaloid successfully employed at Philadelphia. The second alternative may seem visionary at first sight, but when we consider the results at which Mr. M'Ivor has arrived, and, further, the circumstances under which Chinchonidine is produced, this view of the case may be altered.

In No. 7, we have an illustration of what careful cultivation will do, as the plant *C. micrantha*, which (with its congeners the Grey Barks) produces *largely* and *chiefly Chinchonine* in its native climate of Huanuco†, now produces a very small portion of Chinchonine, and a large quantity of the allied alkaloid *Quinidine*. This is, then, a hopeful change, if time should confirm the observation.

Then Chinchonidine seems almost always to accompany Quinine *in greater or less abundance*. It does so in the *Calisaya* of Bolivia, in the *lancifolia* barks of New Granada, and in various barks of Ecuador and Peru, and markedly in the best of the barks of Loxa. It is highly probable that a very slight circumstance in the growth may determine the production of one or other alkaloid. Dr. Herapath has shown in a communication to the Royal Society, " Researches on the Chinchona

* "Illustration of 'Nueva Quinologia,' *sub voce* Chahuarguera."

† A peculiar climate, of which I have recorded Mr. Pritchett's description under head *C. micrantha*.

Alkaloids,"* that the *Quinine and Chinchonidine salts agree closely among themselves, and differ widely from the Quinidine and Chinchonine compounds.*

I may further remark, that the *Chinchona succirubra* is a tree which varies greatly in its products in its native forests, and that the *Chinchona micrantha,* in Bolivia, approaches to the character of a *Calisaya,* as I have noticed under that head; its bark has a different appearance from that of Huanuco, and, again, this now sent home varies widely from either of the above. I notice, in examination, the peculiar yellow colouring-matter common, it seems, to all the forms of this species (*C. micrantha*), as I have before noticed.

The *Calisaya* bark sent this time by Mr. M'Ivor is, I fear, an illustration of the possibility of change in the wrong direction, as it contains far too large a percentage of Chinchonidine in proportion to the Quinine. The appearance of the bark indicates a not very vigorous growth, or, at all events, it differs from that it assumes in its native locality. It would never be recognized as the bark of *Chinchona Calisaya.*

The bark of No. 6 is recognized by an experienced dealer as "thin rusty crown, worth 1*s.* 3*d.* to 1*s.* 4*d.* per lb."† It is, I presume, the bark of the variety *Bonplandiana, i. e.* the *colorada del Rey,* as brought home by Cross; it is remarked as more red than is customary with rusty crown.

As the quantity of bark in No. 1 and No. 4 was not exhausted in my experiments, I have returned 1000 grains of each of these, thinking that it would be a satisfaction to the Government to engage Dr. de Vrij, whose chemical skill and experience are so well known, in further researches on the subject.—I have, etc.

JOHN ELIOT HOWARD.

* Dated 19th June, 1857.

† *From Messrs. Jenkin and Phillips to Mr. J. E. Howard.*—"51, Lime Street, 21st July, 1865.—The sample of bark you left with us appears to be thin rusty crown, worth 1*s.* 3*d.* to 1*s.* 4*d.* per lb. We thank you for the sight of it."

CONTRIBUTIONS TO BRITISH LICHENOLOGY; BEING NOTICES OF NEW OR RARE SPECIES OBSERVED SINCE THE PUBLICATION OF MUDD'S 'MANUAL.'

BY ISAAC CARROLL, ESQ.

(*Concluded from Vol. III. p.* 293.)

II.

Pyrenopsis hæmatopis (Smmrf.), Nyl. Lich. Scand. p. 288.—Rocks on Ben Lawers, rare (Jones).

P. diffundens, Nyl. in litt. n. sp.—Maidstone, Kent (Jones). In the September number of the 'Journal of Botany' this plant was incorrectly named "*Collema diffractum*, Nyl.," which is a very different plant, not yet found (so far as I am aware) in Britain.

Collema chalazanum, Ach. Nyl. Syn. Lich. p. 104.=*C. maritimum*, Tayl. ms.—Near Dunkerron, Kerry (Mr. J. Taylor in Herb. Jones); on limestone near Fermoy (Mr. T. Chandlee in Herb. Lindsay, commun. by Carroll).—Spores 8 in thecæ, ellipsoid, simple.

C. biatorinum, Nyl. Syn. Lich. p. 110.—Maidstone, Kent (Jones).

C. psorellum, Nyl. in litt. n. sp.—On rocks, Ben Lawers (Jones).

Leptogerum lacerum (Sw.), var. *crenatum*, Nyl.=*Leptogium fragrans*, Mudd, Man. p. 46.—Yorkshire (Mudd in Herb. Carroll).

Calicium trichiale, Ach., var. *cinereum*, Pers.—On old Pines at the Deer Park, Castlemartyr, co. Cork, and on old Oak at Tervoe, near Limerick (Carroll).

C. curtum, Borr.—On old Pines, Deer Park, Castlemartyr, co. Cork (Carroll).

The *Calicia* are rarely met with in Ireland.

Stereocaulon nanum, Ach.—Learmount, co. Derry (Jones).

Cetraria Islandica, (L.)—Very rare in Ireland. Re-discovered in August, 1865, on Mangerton (Dr. Taylor's station) by Vice-Admiral Jones.

Platysma commixtum, Nyl. Lich. Scand. p. 83.—On rocks, north side of Ben Lawers, July, 1864 (Carroll).

Physcia speciosa (Wulf.), Fr.—Glenarm, co. Antrim (Dr. Moore).

Umbilicaria hyperborea, Hffm.=*Gyrophora proboscidea, c. corrugata*, Mudd, Man. p. 118.—Brandon, Kerry (Dr. Moore).

U. polyphylla (L.), Schrad.—Rocks at Luggela, co. Wicklow (Jones).

Lecanora holophæa, Mnt.; *Lecidea sublurida*, Nyl. (olim) = *Thalloidima sublurida*, Mudd, Man. p. 172.—Not rare in crevices of rocks all round the Irish coast.

L. poriniformis, Nyl. Flora, July, 1865, p. 353.—Rocks on Mael Grae (Jones); Ben Lawers (Carroll).—This singular plant has quite the aspect of *Pertusaria*, but ranges near *Lecanora verrucosa*.

L. helicopis (Whlnb.), Nyl. Lich. Scand. p. 158; var. *dilutior*, Nyl. —Glenarm, on chalk (Jones).

L. Sambuci (Pers.), Nyl. Lich. Scand. p. 168.—Armagh (Jones). "Thecis 8–12, 16–32 sporis," Nyl.

Pertusaria gyrocheila, Nyl. Flora, July, 1865, p. 354.—On rocks, near the summit of Lawers (Carroll).

P. ophthalmiza, Nyl. Lich. Scand. p. 180.—"Thecis monosporis. Sporis usque longit. 0·160–0·205, crassit. 0·080, 0·100 millim."—On aged Pines, Glenfalloch, Scotland (Carroll).

Thelotrema subtile, Tuck.—Glengariff, August, 1865 (Jones).

Lecidea foveolaris, Ach.—On the ground, summit of Lawers (Carroll and Jones).

L. fuliginosa, Tayl. = *L. confusa*, Nyl.—"Nomen Taylori restituendum," Nyl.

L. atro-rufa, Ach.—Douce Mountain, co. Wicklow (Jones).

L. fusca, Schær. Nyl.—On decayed moss, summit of Lawers (Carroll and Jones).

L. cuprea, Smmrf., var. *Berangeriana*, Mass. Nyl.—Near the summit of Lawers, on the ground (Carroll and Jones).

L. anomaloides, Nyl. Flora, 1862, p. 464; var. *denigrans*, Nyl.—On the ground, Ben Lawers (Jones).

L. sphæroides, Smmrf.; var. *vacillans*, Nyl. Lich. Scand. p. 204.—Armagh Demesne (Jones). Var. *rediens*, Nyl. = *Biatorina sphæroides*, Mudd, Man. p. 177.—On trees, Florencecourt (Jones).

L. sabuletorum, var. *syncomista*, Flk. = *Bilimbia sabulosa*, Mass. = *Biatora Regeliana*, Hepp. Flecht. 283.—On the ground, Morâne (Jones); Ben Lawers (Jones and Carroll).

L. improvisa, Nyl. Lich. Scand. p. 213.—On palings, Stableford, Shropshire, October, 1864 (Leighton in Herb. Jones); Skelefteå, Swedish Lapland, August, 1863 (Carroll).

L. aromatica, Turn.; var. *hypsophila*, Nyl. in litt. = *Bilimbia sabulosa*, Mudd, Man. p. 189 (the Lawers specimen).—Ben Lawers, with *L. alpestris*, Smmrf. (Jones).

L. parasema, Ach.; var. *monticola*, Ach.; (*L. nitidula*, Fr.) var. *pura*, Nyl.—On rocks, near the base and at the summit of Lawers (Jones and Carroll).

L. alpestris, Smmrf. = *L. assimilata*, Nyl. Lich. Scand. p. 221.—On the ground, near the summit of Lawers (Jones and Carroll); Arctic Norway (Fries, Carroll).

L. limosa, Ach.: Nyl. Lich. Scand. p. 221. = *L. Wulfenii*, Mudd, Man. p. 200 (the Lawers specimen at least).—Ben Lawers and Mael Gral (Jones).

L. tessellata, Flk.—Mael Grae (Jones); Ben Lawers (Jones and Carroll).

L. areolata, Schær.—Mael Grae (Jones); Ben Lawers (Carroll).

L. myriocarpoides, Nyl.; *L. expansa*, Nyl. (olim); Mudd, Man. p. 268.—Battersby, Yorkshire (Mudd in Herb. Carroll).—"Videtur bona species," Nyl.

L. contristans, Nyl. Flora, July, 1865.—On decayed moss, summit of Lawers, July, 1864, very rare (Carroll).

L. neglecta, Nyl. Lich. Scand. p. 244?—Frequent on Lawers, but without apothecia.

L. scabrosa, Ach.—On slate rocks, south of Ireland (Hutchins in Herb. Lindsay, commun. by Carroll).—Spores 1-septate, dark-brown. Thallus yellow. *L. scabrosa*, Fl. Hib. pt. 2. p. 122, is merely a saxicolous form of *L. parasema*.

Opegrapha lentiginosula, Nyl. Flora, July, 1865, p. 355.—Glenfalloch, Scotland, on old Pines, July, 1864 (Carroll). A smaller plant than *O. lentiginosa*, Lyell, but with *larger* spores, etc.

Arthonia punctiformis, Ach.; Nyl. Lich. Scand. p. 260 (sed non *A. punctiformis* of Mudd, Man. p. 247); var. *verrucariella*, Nyl. in litt.—Aviemore (Jones).

A. pineti, Krb.; Nyl. Lich. Scand. p. 261.—Glencar, Kerry (Carroll), probably not rare.

A. ruderalis, Nyl. Lich. Scand. p. 262. = *Lecidea lapidicola*, Tayl. in Fl. Hrb. pt. 2. p. 124.—On stones, Cappaghmore Bridge, Kerry! (Taylor); on rocks, near the summit of Lawers (Carroll).

Verrucaria cartilaginea, Nyl. Lich. Scand. p. 268.—On the ground, near the summit of Lawers (Carroll).

V. tristicula, Nyl. Flora, July, 1865, p. 356. On moss, Aviemore (Jones).—"Species insignis accedens ad *V. gelatinosum*, Ach.," Nyl. l.c.

V. isidioides, Borr. = *Dermatocarpon isidioides*, Mudd, Man. p. 270.—Thecæ normally 8-spored; spores when young 7-septate acute, in age obtuse muriform dark-brown; inch 0·015 long, by 0·006 broad; paraphyses conglutinate, hymeneal gelatine unaffected by iodine, or only tinged of a pale straw-colour.—On slate rocks, Glengariff (Hutchins in Herb. Lindsay, commun. by Carroll). On examining good specimens I find that this curious plant has no affinity, except in a very close outward resemblance, with *V. clopima*, to which I had incorrectly referred it in the first part of these 'Contributions.'

V. theleodes, Smmrf.; var. *inundata*, Nyl. in litt.—Moist rocks, Ballaghbeama Gap, Kerry (Carroll); and in a stream at Cromaglown, Killarney (Jones).

V. nigritella, Nyl. Flora, July, 1865, p. 357.—Thallus doubtful; apothecia, which are prominent, black; occur between the scales of *V. tephroides*, near the summit of Lawers (Carroll). Spores dark-brown, oblong ellipsoid, variously divided (very like those of *Urceolaria scruposa*) much smaller than the spores of *V. nigrata*.

V. integra, Nyl. Pyrenoc. p. 31.—On rocks, near Cork (Carroll).

V. prominula, Nyl.—In a dark cave by the sea, at Kilkee, co. Clare (Carroll).

V. superposita, Nyl. Flora, July, 1865, p. 357.—Parasitic on thallus of *V. theleodes*, Smmrf.—Near the summit of Lawers (Carroll and Jones). A curious little plant, not unlike *V. Borreri* in miniature. Spores 1-septate.

V. endococcoidea, Nyl. Flora, July, 1865, p. 356.—Parasitic on thallus of *Lecidea excentrica*, near the summit of Lawers (Carroll). What is apparently the same plant occurs at Killarney, and near Dublin, also on thallus of *L. excentrica* (Jones). "Sporis iodo cærulescentibus."

V. dubiella, Nyl. Flora, July, 1865, p. 356.—On moss, north side of Ben Lawers, July, 1864 (Carroll). "Species bene distincta, forte parasita; sporis sat parvis 3-septatis," Nyl. l. c.

V. epidermidis, Ach.; var. *allogena*. = *V. allogena*, Nyl. Flora, July, 1865, p. 357.—Near the summit of Lawers, growing on thallus of *Lecidea excentrica* (Carroll).

V. epidermidis, Ach.; var. *platypyrenia*. = *V. platypyrenia*, Nyl. Flora, July, 1865, p. 358.—On Ivy, at Ballyedmond, co. Cork, and at Old Dromore, Kerry (Carroll). Spores 3–5-septate.

V. innata, Nyl. Flora, July, 1865, p. 358.—On thallus of *Lecidea Hookeri*, Schær. (*Decampia Hookeri*, Mudd.)—Ben Lawers (Jones). Spores 1-septate, colourless.

ON THE MEANING OF THE NAME WALNUT.

Mr. G. B. Airy lately advanced the opinion ('Athenæum,' 1865, p. 653) that the national name "Welsh" might possibly be a corruption of the word "Belgæ." This opinion I endeavoured to controvert (ibid. pp. 690, 728, 774) by showing that the term Welsh, identical with the German Welsch, Wälsch, or Kauderwelsch, was and is applied by Teutonic nations to foreigners and foreign things in general. "The Saxons conquering this island," says Sir John Dodridge, in 1620, "called the said territorie [Cambria] Wallia, and the people Welshmen, that is to say unto them strangers." The modern Germans call Italy "Wälschland," and the Italians "Wälsch." There is only one other English word in which the original meaning of the word has been preserved, *i.e.* "Walnut," which in German is "Wälsche Nuss" (="Welsh Nut"), as the turkey-cock is "Wälscher Hahn" (=Welsh cock). Both the Walnut and the turkey being indigenous to the Indies, the former to the East and the other to the West, it shows that the Germans do not use the term "Welsh" in the restricted sense of Italian, as has been maintained. The Walnut was cultivated in Italy in Pliny's time, and if it had come to us direct from that source instead of the Trans-Caucasian countries, we should probably have for it a corrupted Latin name, as we have for nearly all those of our fruit-trees (Cherry, Plum, Pear, etc.) for the introduction of which we are indebted to the Romans. BERTHOLD SEEMANN.

PHYLLOMANIA.

Are there any people who entertain a real affection for flowers? If so, then how does it come to pass that flowers at one time the greatest favourites are, after a few years of popularity, no longer looked at,—in common parlance, gone out of fashion? Our great nurserymen are the first to find out in which direction the taste is tending; as soon as a plant ceases to be inquired for, they get rid of it at any price, to fill its

place with the few favourites of the public; and the effect is, that plants which were seen in every garden, though their price was high, become extremely scarce, and finally disappear altogether. Fashion, in this as in other things, is never without a reason for adopting an innovation. The Cactuses, of which, at one time, ship-loads came to our shores, were discarded because they were such spiny, irritating things, and which, in public gardens, you were requested not to touch. The Aloes, now only seen in all their diversified forms in Prince Salm-Dyck's magnificent works, had to make room for less interesting types, because you had to wait for a series of years before many of them flowered; popular opinion declared it was sometimes a whole century. Such plants might be in their place in antediluvian times, when people as old as Methuselah were plentiful, but scarce fit garden-pets when human life seldom reaches fourscore years. Then came the reign of the Dahlias, a brilliant and prosperous one, but suddenly cut short by the startling discovery that they flowered late in the autumn, and were apt to be killed by the first night-frost. Last autumn, when enjoying the fine show of Chrysanthemums in the Temple Gardens, we trembled at the very thought that somebody who has a voice in the fashion of flowers should find some argument why this lovely sight should not be seen; why the Chrysanthemum, with its marvellous variety of colour, much more the "Pride of London" than the little humble Saxifrage of that name, should be banished for some new, untried favourite, perhaps not half so well adapted to the smoky atmosphere of our capital.

As long as one set of flowers is superseded by another, there is, perhaps, not much to complain of; but a fashion is gradually creeping in, well calculated to create alarm. Endeavours are now being made to persuade us that it is but a depraved taste to admire flowers at all; that it is the foliage on which nature has lavished the greatest beauty, and that here real taste has proper objects for gratification. The Ferns were the first of this class of plants which gained a footing amongst us. The elegant and graceful tracery of their foliage was so bewitching that a perfect rage for them sprang up, and during the last ten years more books have been written about them than since botany became a science. The species indigenous to our islands have been illustrated in every imaginable manner; in bulky volumes, as in 'The British Ferns Nature-printed,' and in portable companions, as in 'The British Ferns at One View.' There is hardly a publishing house that has not

aided us in understanding the subject by issuing one or more volumes, and there are few eminent botanists who have not given us the benefit of their experience in this branch of study. The success which the Ferns achieved was the greatest triumph of flowerless plants over flowers ever recorded. It was the commencement of a rage for fine foliage plants, as gardeners call them, of that *phyllomania* now spreading through the length and breadth of Europe. All plants with variegated leaves became much sought after. A species which would not be looked at if preserving the natural green of its foliage, became at once an object of interest if labouring under a kind of albinism so as to make it appear mottled. But white and green was not enough to cause variety; the eye wanted more; and during the last few years the whole of the globe, inhabited and uninhabited, has been searched for plants with leaves having more than two colours,—if possible, all those of the rainbow. The search has been productive beyond expectation, and we have now in our Caladiums, Arums, Begonias, Marantas, Cannas, and others, an endless series of these favourites. The latest development of phyllomania seems to be decidedly towards large and hard-leaved plants; all that are soft and weedy are to be cast aside. Here horticulture has lit upon inexhaustible stores, and amongst them the most majestic of all known plants, the great Palm tribe.

THE PREVENTION OR MITIGATION OF DROUGHTS IN AUSTRALIA.

When reading the appalling accounts of the long droughts in the desert districts of Australia, we are ever led to reflect by what measures they might be alleviated or obviated. On more than one occasion I have pointed out that the wide dissemination of trees in the arid parts of the interior would exercise a beneficial effect on the increase of rain, on the retention of humidity, and on the mitigation of burning winds. For the purpose of raising timber on shadeless barren wastes, perhaps no country possesses greater facilities than Australia, inasmuch as some of our trees would seem to surpass those of any other country in celerity of growth, and in power to resist the dry heat of our summer season. I am sure that if in the extensive sheep-runs now visited by the drought the Cape Wattle (the West Australian *Acacia Lophantha*), the ordinary Wattle-tree of Victoria

(*Acacia mollissima*), and *Eucalypti* of quick growth, were raised, merely by scattering during the earlier part of the cool season quantities of the seed, we should in due time have no longer to lament the destruction of vast flocks for want of fodder, and perhaps water, because the general climate of such districts would gradually become more humid. Under the shelter of timber vegetation herbage would continue to cover the soil now generally naked, even during summer, and from a heated bare surface there would no longer rise that heat which now disperses every rain-cloud often for many a month, and sweeps in currents of burning winds over the continent. Moreover, the absorbing power of vegetation would prevent, to a large extent, the rain-water from flowing away into temporary channels, and perhaps even the sudden and transient floods after thunder-storms. Why the pastoral tenants in districts subject to drought do not cause the seeds of trees, especially such as mentioned, to be gathered and sown, with a view of establishing belts of timber, appears strange. The seeds of *Acacia Lophantha* and *Acacia mollissima* might be gathered by tons at trifling expense, and sufficient seeds for 100,000 *Eucalypti* might be obtained for the value of a few head of cattle. If merely the flocks were kept away for a season from the spots on which the *Acacia* seedlings spring up, it would become an impossibility to annihilate the copses, even by subsequent inroads of cattle, sheep, etc., which indeed might to some extent browse on the young trees, and find in dry years additional food. Around Jerusalem, in Natal, in some of the South Sea Islands, in the high lands of India, and in Algeria, we have, by transmission of seeds, endeavoured to clothe the naked soil and ameliorate the climate. In Australia, however, almost no exertions are made in this direction. Not the least of the advantages of the measure which I urge anew consists in the augmentation of the fertility of the land, by bringing, through the ever-active power of vegetation, the latent and dormant alkalies, and earths and acids needed for the nutrition of plants, to the surface from strata into which the roots of trees will penetrate for food, to convey it to their foliage, and to leave these fertilizers with the decay of the leaves on the surface soil, to be stored up for subsequent vegetation. But the remarks here offered apply not to Australia alone. Who can look at a North African landscape without reflecting what changes an extensive Australian *Acacia* and *Eucalyptus* vegetation would effect on mountains

and plains, now without trees and water? What amount of timber might not be grown on the desert ridges? A few years would completely change the aspect of those countries, so near to the seats of ancient industry and learning; and afford vast means for human settlement, and activity, and support. FERDINAND MUELLER.

Melbourne Botanic Gardens, Oct. 24.

NEW PUBLICATIONS.

A Treatise on the Nature and Cultivation of Coffee; with some remarks on the Management and Purchase of Coffee Estates. By Arthur R. W. Lascelles. London: Sampson Low, Son, and Marston. 1865.

This pamphlet contains some practical hints about the cultivation of Coffee, by the Managing Director of the Moyar Coffee Company, who, "during his planting experience of nearly a quarter of a century,"—in the East Indies, we presume,—has frequently had occasion to regret the absence of such information as is here sought to be afforded." The total quantity of Coffee consumed in Great Britain in 1864, was about 35,000,000 lb., of which nearly 30,000,000 lb. was the produce of India and Ceylon. The total exports into Europe amount now to about 290,000,000 lb. France alone consumes one-sixth of the total production of the world. The Eastern hemisphere appears quite to have taken the place of the Western. In 1809 the exports from Jamaica alone exceeded 83,000,000 lb., whilst at present they do not reach 6,000,000 lb. In British Guiana the exports have fallen in a like manner from 9,472,000 lb. to nothing, scarcely sufficient being now grown for the consumption of the colony. In Portorico the production has slightly increased, but Brazil, which in 1859 exported 2,026,819 bags, now only exports less than a million and a half.

It is strange that Coffee should be called "Kahwah" in the Abyssinian province of Cafe (see Harris's 'Highlands of Ethiopia,') and that the same name (Kahwah=Kawa or Kava) should be applied by the Polynesians to their favourite beverage and the plant from which it is derived (*Macropiper methysticum*).

Outlines of Elementary Botany. For the Use of Students. By Alexander Silver, M.A., C.M., M.D. London: Henry Renshaw. 1866.

This book is what it professes to be, an introduction to the larger

and standard works on elementary botany, and we have pleasure in recommending it as a clear exposition of the matter which every beginner must make up his mind to master before he can have anything like a satisfactory notion of the aim and object of botanical science. Our only regret is that the author is so far behind the age in the systematic portions of his little book. How much he could have simplified it, if he had been aware of how many of the Natural Orders he upholds leading systematists have done away with by combining them with others! We counted no less than twenty Orders which are now generally suppressed. The woodcuts materially aid the author's explanations.

BOTANICAL NEWS.

We have already announced that the Executive Committee of the International Horticultural Exhibition has unanimously elected M. Alphonse de Candolle, Chairman of the Botanical Congress. We have now to add that that distinguished botanist has formally accepted the office, and that, judging from the tone of our press, and what one hears on all sides, the election seems to have given great satisfaction. "In the scientific world," says the 'Reader,' "De Candolle's name is a tower of strength, and there is now every reason to hope that the Congress will be a decided success. A good many leading botanists have already given in their adhesion to the scheme, and promised suitable papers." "No better selection could have been made," says the 'Gardeners' Chronicle,' "for M. de Candolle possesses a European reputation; and we therefore congratulate the Committee on having appointed so efficient and influential a person to so important an office. It now remains for botanists and botanico-horticulturists, both of Europe and the British Isles, to be prepared to rally round the chair." "It would have been difficult," writes the 'Athenæum,' "to select a scientific man better fitted for the office than the gentleman elected; for 'the name of De Candolle,' to borrow the words of a leading American botanist, 'is, perhaps, the most prominent one with the cultivators of science the world over,' and is associated 'with a larger amount of botany than any other name, except that of Linnæus.'"

Dr. Richard Schomburgk has been appointed Director of the Botanic Garden of Adelaide, South Australia. Our readers are aware that this gentleman is a brother of the late Sir Robert Schomburgk (whose posthumous papers on Siam are about to be published by Messrs. Trübner and Co.), and that he also travelled in British Guiana.

Dr. H. Barth, the famous African traveller, died on the 25th of November, at Berlin, where he was actively engaged in philological and geographical studies. He was the last surviving member of the Central African expedition.

A paragraph, which has gone the round of most of the Continental news-

papers, to the effect that Dr. Seemann is about to start on an expedition to North-eastern Asia, is entirely without foundation.

Professor Schleiden, who has retired on his pension to Dresden, is said to be engaged on 'A Life of Linnæus.'

The Rev. W. A. Leighton, F.L.S., is preparing for publication a Synopsis of British Lichens.

We have received an account of the 25th anniversary of the Natural History Society, "Pollichia," which was celebrated in September last, at Deidesheim, under the presidency of Dr. Pauli. The Town Hall had been placed at the disposal of the meeting, and assumed a festive appearance, being decorated with garlands, and the names of Koch, Bruch, Bischoff, and other botanists of the district who attained a European celebrity. The scientific papers were numerous; we mention Professor Bach's on the fertilization of plants by insects, especially that of *Aristolochia Clematitis*; Professor Fenzl's on hybridization, with special reference to *Centaurea*; Dr. Schultz's on hybridization in its bearing on the Darwinian theory; Dr. Hofmeister's defence of Darwinianism, and Professor Kirschleger's on certain morphological changes in the flowers of *Anagallis phœnicea*. The inhabitants of this famous vine-growing district seem to have outdone themselves in hospitality, and a new sort of sparkling hock was submitted to the assembled *savants*, which, on receiving their approval, received the name "Pollichia wine."

Under the title 'Du Spitzberg au Sahara,' Professor Charles Martins, of Montpellier, has published Natural History observations on various countries within those limits. Those on the flora of Spitzbergen form a useful supplement to Dr. Torrel's valuable paper, printed in the second volume of our Journal.

On noticing Dr. F. Mueller's 'Vegetation of the Chatham Islands' we expressed regret that the author had not deferred his publication until Dr. Hooker's 'Handbook of the New Zealand Flora' should have reached him. We might have written with equal justice that the author of the New Zealand Handbook ought to have waited until the Chatham Florule had come to hand. To atone for whatever indiscretion we may be deemed guilty of, insertion is here given to a passage of Dr. Mueller's official Report to the Victorian Parliament, which we are informed has a special bearing upon our notice:—"At the time when the plants of the Chatham Islands were received [in Melbourne] and rendered known, a volume on the plants of New Zealand, written by Dr. J. D. Hooker, passed, in London, through the press, for which Mr. Travers's collections became not timely accessible. But while the new researches on the New Zealand plants were still unknown to me, I purposely gave simultaneous publicity to my own observations, in order that the independent views of two observers might be compared." Dr. Mueller then goes on to say that, whilst Dr. Hooker admits no less than seventeen New Zealand *Epilobiums* and nineteen *Veronicas*, he recognizes but one species of each genus; "that through want of extensive field studies untenable limits are assigned to a vast number of supposed specific forms," and "that the vain attempt to draw lines of specific demarcation between mere varieties or races . . . has largely tended to suggest the theory of transmutation." Dr. Mueller then repeats once more that he is decidedly opposed to the Darwinian theory.

Tab. 12.

W.H. Fitch, del. et lith.

Vincent Brooks, Imp.

ON *INULA SALICINA* AS AN IRISH PLANT.

By D. Moore, Ph.D., F.L.S.

(Plate XLIII.)

At page 333 of Vol. III. of this Journal, there is a notice of the discovery of *Inula salicina* in Ireland, and the Plate now given is taken from specimens collected at Lough Derg, in August, 1865.

The following may be considered as the specific character and synonymy :—

I. salicina, Linn. Sp. 1238 ; Vill. Dauph. iii. p. 247 ; De Cand. Fl. Fr. iv. p. 154.

Aster salicinus, Scop. Carn. ii. p. 172 ; Ic. Fl. Dan. t. 786 ; Rchb. Exsic. 2458.

I. cordata, Boiss. Diagn. iv. p. 3. Wlprs. Rep. vi. p. 141, fide Schultz-Bip.

Stem from 6 to 14 inches high, firm, angularly striated, simple or branched near the summit, more or less clothed with hairs in the Irish plant (smooth on foreign specimens); leaves cordate-lanceolate, semi-amplexicaul at the base, midrib and under-surface hairy in the Irish plant (glabrous on foreign specimens) bluntly dentate on the margins, and slightly recurved at or near the apex ; flowers terminal, solitary or in corymbs, bright yellow; scales of the involucre ovate-lanceolate, roughly ciliated at the margins, with reflexed apices ; achænia smooth. Fl. July.

Hab. On the county Galway shore of Lough Derg, among rough herbage and stones, in considerable abundance, about three-quarters of a mile south-west of Portumna.

The foregoing description shows that our plant differs in some respects from the normal form of the species, especially in being more pubescent on the stems and leaves, and also in the latter being more dentate on their margins. These characters, however, appear to vary according to circumstances, as may be gathered from the descriptions of the several authors who have described the plant.

On comparing the examples brought from Portumna with plants under cultivation at Glasnevin, the differences were such as to cause some doubt whether our plant is not equally near to *I. semiamplexicaulis*,

Reuter, as it is to the typical form of *I. salicina*. Authenticated specimens of the former show that such is not the case. It is a stronger-growing plant than the latter, with more amplexicaul leaves, which are more crowded on the stem, and densely covered with short hairs.

I. salicina is known to inhabit France, Italy, Switzerland, Germany, Scandinavia, and Denmark; it might consequently be expected to appear somewhere in the British Isles, as is now proved to be the case, though the present is the only instance hitherto recorded.

I have great pleasure in supplementing these remarks by some observations on the genus *Inula* in general, and *I. salicina* in particular, which Dr. C. H. Schultz Bipontinus has addressed to the Editor, and which, coming from such a source, are important.

"The extensive genus *Inula* forms three subgenera, which may be characterized as follows:—

"I. Inulaster, Schl. Bip.—Flores omnes tubulosi, 5-dentati, hermaphroditi.

"II. Cappa, De Cand. Prod. v. p. 469.—Flores radii ♀, stylo breviores parvæ, disci tubulosi, 5-dentati ⚥.

"III. Euinula, Schl. Bip.—Flores radii ♀ lingulati, ligulis disco longioribus conspicuis, disci ⚥ tubulosi, 5-dentati.

A. Achænia hirta.

B. Achænia glabra.

a. Capitulis ∞ mediocribus in corymbum dispositis.

α. Folia decurrentia. (*I. thyrsoides*, De Cand.; *I. bifrons*, Linn.)

β. Folia sessilia. (*I. Germanica*, L. etc.)

b. Capitulis paucis majoribus rarius in corymbum dispositis.

α. Folia basi angustata, infra tomentosa, capitula mediocria, corymbosa. (*I. Vaillantii*, Vill.*)

β. Folia cum caule 1-oligocephalo hirsuto. (*I. hirta*, Linn.)

γ. Folia cum caule glabrescentia.

* Folia oblongo-lanceolata, valde reticulata.

† Sessilia, præcipue suprema apiculata. (*I. squarrosa*, Linn.)

†† Auriculata-amplexicaulia (*I. salicina*).

"*Inula salicina* has a wide geographical range, being met with in the

* The nearest ally of *I. Vaillantii*, Vill., is *I. Japonica*, Thunb., which I have from Japan (Zollinger! n. 281, and Göring! n. 240).

whole of Europe, with the exception of the extreme northern and southern parts, and extending through Asia Minor to Persia, where it seems to belong to the subalpine region and through European Russia into Siberia. The *Inula* discovered in Ireland, judging from Plate XLIII. of the 'Journal of Botany' forwarded to me, is the genuine *I. salicina,* and Ireland therefore the north-western limit of this widely-diffused plant. With us in the Palatinate the plant is common in meadows, on rivulets, and at the foot of small hills, flowering from the beginning of July till August. I have it from nearly every part of Germany, viz. Würtemberg, Baden, Bavaria, Austria, and Prussia, as far as Berlin (C. Bolle!) I have also seen it from many other parts of Europe, but as yet not from Spain, where, according to Loscos and Pardo, Ser. inc. Pl. Arragon, it grows in the province of Arragon. In France it is abundant, viz. about Paris (Kralik! Leret!), Lyons (A. Jordan!), and Meude (Prost!). In Switzerland it was collected by Perty and Lagger. In Italy it extends as far as Naples (Gussone!). Other localities are: Croatia (Farkas Vusotinovio!), Serbia, (Pancic!), Banat (Wierezbicki!), Ucrania (Turczaninow!), Petersburg in monte Duderhof (Körnicke!), Sweden (Fries! Herb. Norm. xiv. 2), and Norway, near Christiania (Blytt!). In Asiatic Russia, *Inula salicina* is also widely distributed (*vide* Gmelin, Fl. Sib. ii. 177. t. 77! and Turcz. Fl. Baic. Dahur. ii. p. 28). From Asia Minor it extends to Persia, viz. in M. Elbrus pr. Derbend, July 5, 1843 (Kotschy! n. 443*a*), Karadagh, July, 1847, and Albrus Mountains, June, 1848 (F. Buhse!), and Caucasian Baths (C. Koch!).

"Broad-leaved forms (*I. salicina, β. latifolia*, Visiani) I have from Dalmatia (Visiani!), Roumelia (Noe!), Russian Armenia and Daratschitschak (C. Koch!).

"*Inula cordata*, Boiss. Diagn. iv. p. 3; Walp. Rep. vi. p. 141, which Kotschy (Iter Syric. n. 255!) collected in 'locis subhumidis supra mar Tserkis, alt. 4500, 19 Jul.,' is identical with *I. salicina,* judging from authentic specimens communicated by M. Boissier. Exactly the same plant I have from Daghestan (C. Koch!).

"*I. salicina* is closely allied to *I. viscidula,* Kotschy et Boiss. (in angustis rupestribus Tenz dictis, alt. 6500 ped., die 9 Sept. Kotschy! Iter Cilicico-Kurdistan., 1859, n. 446), but is distinguished at first sight by its robust habit, its oval-oblong, attenuate, more sessile, and slightly serrate leaves, its poly-(26-)cephalous corymb, and its achenia,

which are furnished towards the top with but short small hair. *Inula semiamplexicaulis*, Rent., from Geneva, Bois de Batie (Lagger!) appears to be a hybrid between *I. salicina* and *I. Vaillantii*, whilst *I. semiamplexicaulis*, Visiani, is identical with *I. squarrosa*, Linn. *I. media*, M. B., judging from specimens from Creuznach, Bingen, and Mainz, seems to be a hybrid between *I. salicina* and *I. Germanica*. *I. hybrida*, Baumg., seems to be a hybrid between *I. salicina* and *I. ensifolia*, judging from specimens from Hungary (Kruzisch!), Vienna (Skofitz!), Serbia (Pancic! mixed with *I. ensifolia*).

"** Folia lanceolato-linearia, nervis longitudinalibus percursa parallelis, sessilia, glabra v. suprema cum caulis parte superiore villosa. (*I. ensifolia*, Linn.)

"*I. ensifolia*, Linn., is the nearest ally of *I. salicina*, and is confined to southern Europe, extending from the Tyrol, Piedmont, Istria, Carinthia, Austria proper, Hungary, Banat, Serbia, Prussia, to Asia Minor, where C. Koch collected it in Grusia.

"*I. ensifolia*, Fries! Herb. Norm. xiv. 1; Gottland (Bunge); in petra calcarea (Träsk-Hedarne), inter Juniperos leg. O. Westöö,—would seem to be on account of its narrow involucral leaves, small flower-heads, the entire glabrousness of the whole plant, and the widely-different geographical range, a new species, or perhaps only a more narrow-leaved form of *I. salicina*. Fries (Sum. Veg. p. 37) seems to entertain the same opinion. Many Compositæ occur with broad and very narrow leaves; for instance, *Hieracium umbellatum*, Linn.=*H. filifolium*, Fries, Symb. Hier. p. 178."

Explanation of Plate XLIII., representing *Inula salicina*, from specimens collected at Lough Derg, Ireland. Fig. 1. A ray floret. 2. A hair of the pappus of ditto. 3. Stigma of ditto. 4. A disk floret. 5. A stamen of ditto; and 6. Stigmas of ditto,—*all magnified*.

ON THE FECUNDATION OF *LUPINUS POLYPHYLLUS*.

By Rev. W. A. Leighton, B.A., F.L.S.

During the last summer, my attention was attracted to the operations of a small humble-bee on the flowers of *Lupinus polyphyllus*

growing in my garden. The bee alighted on the blossom, and by the weight of his body drew down the alæ and keel, and inserted his proboscis to the base of the stamens for the purpose of extracting the nectar. In doing so, I noticed that the stamens, covered with pollen, and the pistil, were slightly extruded from the apex of the keel, and struck against the under portion of the body of the bee, which probably carried some of the pollen away with him, and alighting on other blossoms, thus probably fertilized them.

This curious sight naturally led me to examine more particularly the structure of the blossoms. In an early stage of the flowering, I observed that the standard was flattened or laid close to the other parts of the blossom, but that in full expansion later, the lateral portions of the standard became reflexed. On opening some of the blossoms before the standard was reflexed, I noticed that there were ten anthers of two different sets and sizes, alternating with each other. One of these sets consisted of five very large sagittate anthers; whilst the other set consisted of five very small rotundo-oblong anthers supported on stamens scarcely reaching to the base of the sagittate anthers, but both sets not half the length of the pistil. Strange to say, in this early stage of the blossom, the pollen of the sagittate anthers was all matured and falling from the open anther-cells, whilst the anthers of the other set were all closed and the pollen in an immature state. On examining other blossoms whose standard was reflexed, I found that the large sagittate anthers were all withered, and their pollen gone, whilst the shorter and smaller stamens had become greatly elongated so as to become equal in length to the pistil, their anther cells expanded, and their pollen mature. In this state the elongated stamens and the pistil with the mature pollen of the, at first, small anthers, were by the weight of the bee extruded, and, I presume, fertilization effected. I compared under the microscope the size and appearance of the pollen from the two sets of anthers, but could distinguish no appreciable difference.

I now opened several blossoms with unreflexed standards, and with a camel's-hair pencil took some pollen from the sagittate anthers, and applied it carefully to the stigmas of other blossoms with unreflexed standards, cutting away first the unexpanded anthers of the smaller set of stamens. These blossoms, so treated, I covered with bits of fine muslin to prevent all insect agency. After some time I examined them, and found that fecundation had not taken place, and the legume had not swollen.

It would seem, then, that the two sets of anthers had different powers either on their own stigma or on that of the flower of another plant, for we dare not presume to say that the pollen of the sagittate anthers was wasted; but further experiments are needed to establish these points, and it is with the view and hope that persons who have inclination and opportunity will institute such experiments, and decide this interesting question, that these crude notes are here inserted.

Shrewsbury, January 4, 1866.

SELIGERIA CALCICOLA, Mitten.

By W. Carruthers, Esq., F.L.S.

This inconspicuous Moss, noticed by the Rev. M. J. Berkeley in his 'Handbook of British Mosses' (1863), p. 289, as a new species in the possession of Mr. Mitten which he had not seen, and described and figured by Mr. Mitten in the July number of the 'Journal of Botany' for 1864, was published in the same year by Dr. Schimper in his first Supplement to 'Bryologia Europæa,' Seligeria, p. 1. t. i., under the name of *Seligeria subcernua.* Although acquainted with Mitten's name, and aware that Berkeley had noticed it, he proposed this new trivial designation as characteristic of this, the only species of *Seligeria* which has an inclined and unsymmetrical capsule, and rejected the name *calcicola*, as it was equally applicable to all the species of the genus, inasmuch as they all grow on calcareous rocks.

The species, however, had already been published as British by Sir J. E. Smith, in 'English Botany,' pl. 2506, and both names must give place to his older designation. When arranging, some years ago, the collection of Mosses in the British Herbarium of the British Museum, I noticed that Smith's *Gymnostomum paucifolium* was a different plant from *G. tenue*, Hedw., to which it had been referred by Hooker, in 'English Flora,' vol. v. pt. 1. p. 10, and with a query by Wilson in his 'Bryologia Britannica,' p. 41. Unable to refer it to any of Wilson's species of *Gymnostomum*, I placed it at the time as an additional species, writing a short distinguishing character in my copy of the 'Bryologia Britannica.' When showing our collection to Dr. Schimper, on the occasion of his recent visit to Britain, I drew his attention to

this plant, and he at once recognized it as his recently described *Seligeria subcernua*.

The history of the species begins with Dickson, who described a Moss, found on fragments of bricks, in rubbish heaps, near Wetherby, Yorkshire, under the name of *Bryum paucifolium*, in the fourth fasciculus of his 'Cryptogamia.' Much uncertainty has always existed as to this plant. It was referred by Smith, in 1804, to *Dicranum cylindricum*, Hedw. (*Ceratodon cylindricus*, Br. and Sch.), on the authority of Dawson Turner's herbarium, and it is quite possible this species may have been in that herbarium, although it was not discriminated as a British plant for many years after. Wilson considers it to be *Gymnostomum tenue*, Sch., on the faith of specimens without lid, seen by him in the same herbarium. Smith, in 1813, obtained from Turner specimens of *Bryum paucifolium*, Dicks., which he had received from Eagle, to whom they had been communicated by Dickson himself as a portion of those found on a brick at Wetherby. These specimens figured and described in 'English Botany' (2506) are now in the British Museum, and are the specimens determined by Schimper to be his *Seligeria subcernua*. It is evident that Dickson must have distributed different plants as his *Bryum paucifolium*, and his figure is so general that it does not assist in determining which of the three he really meant; nor does the original drawing, made by Sowerby for Dickson's 'Cryptogamia,' now in the Botanical Department of the British Museum, help to a solution of the matter. As, however, the specimens in the British herbarium are a portion of Dickson's plants from the Wetherby station, they establish his species to be the *Seligeria*; and, as these specimens are the very materials on which Smith founded his *Gymnostomum paucifolium*, there can be no difficulty as to the propriety of restoring its original trivial name. Its synonymy as a British plant will then be as follows:—

Bryum paucifolium, Dicks. Crypt. Fasc. iv. p. 7. t. 11. f. 3 (1801).

Gymnostomum paucifolium, Smith, Engl. Bot. 2506 (1813).

Seligeria calcicola, Mitt. Journ. of Bot. 1864. p. 194. t. 19. f. 1–6 (1864).

S. subcernua, Sch. Bryol. Europ. Suppl. Fasc. i. (SELIGERIA) p. 1. t. 1 (1864).

S. paucifolia, nob.

British Museum, *Jan.* 15, 1866.

ON THE ORCHIDACEOUS GENUS DIDYMOPLEXIS, *Griff.*

BY S. KURZ, ESQ.

Didymoplexis pallens, described and figured by Griffith in M'Clelland's 'Calcutta Journal,' iv. 383, t. 17 (1844), does not seem to have as yet been referred to its proper place. The genus was ranged by Lindley ('Vegetable Kingdom'), probably on the authority of Griffith himself, near *Pogonia*, with which however it has neither a close relationship, nor any natural affinity. A short time ago I found some specimens of this interesting Orchid in flower and fruit. I also saw a drawing of it in the library of the Royal Botanical Gardens, Calcutta, and finally came across some dried specimens of an Orchid in the herbarium of the garden, which were named *Arethusa Bengalensis*, were evidently identical with our plant and probably collected by Griffith. In 1851 we find *Didymoplexis pallens* again described in Griff. Posthum. Pap. Monoc. 378. t. 343 et 344, as *Arethusa ecristata*, Griff., and, a year later, in R. Wight's Icon. t. 1758, under the name of *Apetalum minutum*, Wight. However, the plant was already described in 1825, by Blume in his 'Bijdrage,' as *Epiphanes Javanica*. The Blumean plant is referred by Lindley with a query to *Gastrodia*, notwithstanding the position of the stigma. Blume ('Flora Javæ') enumerates and figures three species of *Gastrodia*, and adopts Lindley's view, as Miquel in his Flora of Neth. Ind. and Thwaites in his 'Ceylon Plants' have done.

We should thus have the following synonymy chronologically arranged, viz.:—

Epiphanes Javanica, Blume, Bijdr. p. 421. t. 4 (1825).

Gastrodia (?) Javanica, Lindl. Orchid. Plants. p. 384 (1830–46); Blume, Fl. Javæ, p. 122, t. 52 (1828–1852); Miq. Fl. N. Ind. iii. p. 717 (1855).

Didymoplexis pallens, Griff. in M'Clelland, Calcutta Journ. iv. p. 383, t. 17 (1844).

Arethusa ecristata, Griff. Posthum. Papers Monocot. p. 378, t. 343 et 344 (1851).

Arethusa Bengalensis, Herb. Calcut.

Apetalum minutum, Wight, Icon. t. 1758 (1852).

I am not sufficiently versed in Orchidology to determine the proper value of the situation of the stigma. Lindley in his 'Orchidaceous

Plants' used it for his two subtribes of *Arethuseæ*. I am inclined to re-establish Blume's *Epiphanes*, which differs in habit from *Gastrodia sesamoides*, R. Br., as figured in Hooker's 'Tasmanian Flora.' The fruit, too, seem to be different, though those of the Australian plant are only insufficiently known. *Gastrodia* is said to be epiphytical, whilst *Epiphanes* is certainly terrestrial.

I must leave it an open question whether *G. Javanica*, Lindl., and *G. Hasseltii*, Bl., are distinct species or not, not having that part of Blume's work to refer to. According to the diagnosis in Miq. Fl. Ind. Bat., however, the Griffithian plant should be referred to *G. Hasseltii*, this having a rugulous crista. The characters of the more or less acuminate sepals appear of doubtful importance, our Bengal plants having them both acute and obtuse. Thwaites refers his Ceylon plant to *G. Javanica*, and I think correctly.

If *Epiphanes* should be incorporated with *Gastrodia*, the sections would be better defined by relying upon the situation of the stigma rather than the labellum, as Professor Miquel has done.

Highly interesting are the pedicels of *D. pallens*. Originally they are only 2–6 lin. long, but when the fruit becomes fully ripe, they elongate and are often twice as long as the whole plant. I measured one more than a foot long and rather thicker than the scape. The bracts vary much, and they are largest in the smaller plants.

The plant varies in height from 2 to 10 inches; and if my identification of *G. Javanica* and *Hasseltii* proves correct, it ranges over Java, Bengal, Ceylon, and Coorg.

Botanic Garden, Calcutta, Nov. 30, 1865.

ON ANADYOMENE AND MICRODICTYON, WITH THE DESCRIPTION OF THREE NEW ALLIED GENERA, DISCOVERED BY MENZIES IN THE GULF OF MEXICO.

By Dr. J. E. Gray, F.R.S., V.P.Z.S., F.L.S.

The subject of this paper has interested me for nearly half a century. I was so struck with the figure of the genus in Lamouroux's work, that I was very anxious to be able to examine it My late dear friend

Edward Bennett and I, purchased all the "*Mousse de Corse*" we could find in London, and searched it most industriously, but without effect. I was therefore greatly pleased when, many years after, Professor Harvey most kindly gave me a series of the species he had found in Florida, which I could study at my leisure, and I found it as beautiful as I had anticipated.

Having recently had occasion to examine the specimens of the genera *Anadyomene* and *Microdictyon*, in the botanical collection of the British Museum, I was much interested in two specimens which were collected by my very kind friend, Mr. Archibald Menzies, in the Gulf of Mexico, in the year 1802, which appear to this time to have been undescribed. One is allied to, but very distinct from, the genus *Anadyomene* of Lamouroux, and is a giant of the tribe. The other is allied to *Microdictyon*, a genus established by M. Decaisne, but differs from it in the frond being free, and on a filiform conferva-like branched stem, the leaf-like frond bearing a resemblance to the frond of *Struvea* of Sonder and Harvey.

The *Anadyomene* has long been known; it was figured by Dillenius; Wulfen described it as an *Ulva*, and the genus was established by M. Lamouroux as a zoophyte, from some specimens which he found in the "*Mousse de Corse*" in the stock of a druggist in Normandy. It is now well known to be an *Alga*.

The form and structure of *Microdictyon* was well described and figured by Colonel Velley in 1799, and his figure is the best, except Harvey's, that we yet have; but he referred it to *Conferva*—that magazine for the articulated *Algæ*.

Professor Endlicher, in the third supplement to his 'Genera Plantarum,' formed the genus *Anadyomene* into a subtribe, under the name *Anadyomeneæ*, p. 18.

Kützing, in his 'Species Algarum,' 1847, forms of the genera *Anadyomene* and *Microdictyon* a family, under the name of *Anadyomeneæ*, p. 371, referring to it the genus *Talarodictyon* of Endlicher, but with doubt. I do not know the latter genus; indeed, it is only described from a figure in the MS. of *Tilesius*.

Professor Harvey, in his very useful 'Index Generum Algarum,' 1860, refers the genera *Microdictyon* and *Anadyomene* with *Struvea*, as genera of the family *Valoniaceæ*, p. 13.

There can be no doubt that the two genera belong to two very dis-

tinct groups, perhaps to distinct families, but this cannot be determined until the fructification and habits of the two genera have been studied; the chief difference between the two groups being that one has the lines of cells united by their sides, so as to form a membranaceous frond, and the other the cells isolated from each other, forming a net with open polygonal meshes, as pointed out by M. Montagne.

There is a certain amount of resemblance between the fronds of the *Microdictyoneæ* and those of *Struvea;* but the cells which form the frond of *Microdictyon* and the stem especially from which the frond of *Phyllodictyon* arises, are much more like the cells of the filament of a *Conferva* than of a *Dasycladus;* on the other hand, *Struvea,* in its structure and mode of growth, is very nearly allied to the unicellular *Algæ.* The stipes and the midrib or axis of the frond is a simple one-celled continuous tube, very unlike the slender articulated stem and midrib of *Microdictyon* and *Phyllodictyon.* Indeed, it appears to me that the stem, the midrib, and the cells that form the reticulation of these two genera are very similar to the cells which form the filament of *Cladophora,* and it would appear that the tribe is more allied to *Confervaceæ* than *Valoniaceæ.*

Group I. Anadyomeneæ.—*The frond membranaceous, formed of articulated forked or digitate proliferous filaments, the interspaces between the branches filled with polygonal cells.*

This group consists of three genera: one, the *Anadyomene* of Lamouroux; one, very like the former genus in appearance, discovered in Australia by Mr. R. Brown; and the third, founded on a beautiful *Alga,* which the late Mr. Menzies discovered in the Gulf of Mexico, and named *Anadyomene Menziesii* by Dr. Harvey.

This *A. Menziesii* has the interspaces filled up, as in *Anadyomene,* but in that genus the main ribs of the frond are formed of a single series of articulations like a *Conferva,* while in the *Conferva umbilicata* of Menzies the main stem is formed of several transverse series of cells condensed into a midrib, differing in this respect from all the other genera of marine *Algæ.*

The genus is evidently the plant referred to by Professor Harvey in the following terms:—" The largest specimen I possess was given to me by the late Mr. Menzies, as having been dredged in twenty fathoms in the Gulf of Mexico. This specimen measures 6 inches, and its

venation offers some peculiarities which perhaps may lead to its specific separation. In our Key-West plants the seriated cells of the principal veins stand apart from each other, or are in single file, having wedge-shaped spaces between. In Mr. Menzies' specimen the principal veins are partly unicellular, partly formed of several parallel closely-placed cells without interspaces; the structure is easily seen, but difficult to describe in intelligible language. Should subsequent observation establish this plant as a species, it may be called *A. Menziesii*." (Harvey, Nereis Boreali-Americana, iii. 50.) I did not discover this observation until after I had described the genus; and I may observe that the simple series of cells is only found, in the larger specimens in the British Museum, in one or two of the smaller lateral branches near the circumference of the frond; all the others are formed of fan-shaped series of cells, from three to five being in each cross-series, and I am more confirmed in this opinion, as I believe there are more than one species of the same form with the typical *Anadyomene* from very different localities, which may be characterized by the form of the cells, and all these species agree in having the main stem formed of a single series of cells very unlike the many-cellular midribs of Mr. Menzies' species from Mexico.

It is to be observed that Montagne, when he first observed the *Microdictyon*, called it a second species of *Anadyomene*, and the character that he gave to distinguish the species was used by Decaisne to separate the two genera, and it is quoted by Kützing as the specific character of the species of *Microdictyon*, although it was drawn up to distinguish it from *A. stellata*.

I may perhaps be regarded as unwise in forming a genus of a plant that Professor Harvey regards even as a doubtful species. I have not done so without great consideration; but when I know that there are at least four, if not more specimens of Mr. Menzies' Mexican plant in collections, viz. the one in the British Museum, one at Kew, one in Dr. Harvey's collection at Trinity College, Dublin, and one or more in Mr. Menzies' own collection, which he left to the Edinburgh Botanic Garden, I cannot but regard it as a distinct form; indeed, Professor Harvey, in a note lately received from him, admits its being so.

Now, if it is a distinct plant, as it presents a very different organization to the other species, which it undoubtedly does, surely that is enough to form it into a genus. I believe that it is a genus likely to meet with

the approval of botanists, or I should not give to it the generic name of *Grayemma*, which, at the suggestion of Mr. Bennett, I propose to do,—that being a combination of the two names of my wife, who has been my companion and helper in all my studies for forty years, and who has some claims to be regarded as a botanist, as for several years she has studied seaweeds not only in the herbarium but in the living state, and has acquired such a knowledge of them that the late Sir W. Hooker entrusted her to arrange the British *Algæ* in the Kew collection; and Mr. Bennett, first to arrange the British, and then the general collection of *Algæ* in the Herbarium of the British Museum. The combination of the two names as a generic one is almost a novelty, but it appears to me that the termination of *-emma* is as pleasant-sounding as the usual diminutive of *-ella*, and in this case more determinative. The name of *Grayia* has been already used in honour of Professor Asa Gray.

Synopsis of the Genera.

Genus 1. Calomena.—Filament of frond formed of linear joints, furcately-branched to the end of the frond; disk of the frond minutely cellular.

Genus 2. Anadyomene.—Filament of the frond formed of ovate cells with diverging cells on the tip, some of which are proliferous, and with cells on the sides; the disk of the frond with regularly disposed small cells.

Genus 3. Grayemma.—Midrib of the frond formed of several parallel series of cells, the terminal bearing radiated cells on their tip, and the disk of the frond formed of diverging cells.

Genus 1. Calomena.

The frond coriaceous, flabellate, imbricate at the base, formed of a succession of single elongated cylindrical cells which separate at the tip into two or rarely three similar cells, and forming a succession of forked (rarely at the lower part of the frond trifid) branches to the margin of the frond; the cells diminishing in length as they approach the margin; the interspaces between the cells minutely cellular.

This genus is most distinct from *Anadyomene*. It is like the furcately-branched *Valonia*, called *Ascothamnion*, expanded and united together into a frond, but the disk of the frond shows none of the

beautiful regularly-placed cells that are to be seen in *Anadyomene.* This genus resembles *Udotea* in the form of its filaments, but differs in the branches being separated by a cellular expansion of the frond, instead of being close side by side. In this respect it is intermediate between *Udotea* and *Anadyomene.*

1. *C. Brownii,* n. s.

HAB. Australia, *R. Brown* in Brit. Mus. A small fragment in my own collection from among Australian weeds. I have sent a portion of the latter to Dr. Harvey for his herbarium at Trinity College, Dublin. This is not the *A. plicata* of Agardh, described as having only a few cells of large size.

Professor Agardh describes another species, with doubt, under the name of *A. obscura,* thus:—"fronde cuneata, venis obsoletis, in mari australi ad insulam Graham; specimen dedit Gaudichaud. *Radix* subglobosa. *Frons* ex angustiori basi (quasi stipula) dilatata, cuneata, longitudine digitalis, unciam lata, sublobata; venæ uniplicatæ, sparsæ, obsolete rubræ. *Color* viridescens, luridus; substantia stipitis firmior, crassior, partis superioris membranacea."—*C. A. Agardh, Species Algarum,* i. 400 (1823); *Kütz. Spec. Algarum, p.* 511.

This may be allied to *Calomena.*

Genus 2. ANADYOMENE.

The frond flabellate, stipitate, often imbricate at the base, formed of a succession of single ovate cells with minute cells in the interspaces; midrib trifid or radiately branched; the primary cell with a series of diverging cells at the tip like a fan, all or three or five of the largest of which bear at their tip a similar series of diverging cells and branches. The upper part of the side of the main cells with a series of small cells on each side placed at right angles with the main cell; the disk of the frond formed of numerous small cells; the margin of the frond formed of fan-like series of cells.

Anadyomene, Lamouroux, Pol. Flex. 365; Agardh, Spec. Algarum, 401; Kützing, Phyt. Gener. 254; Species Algarum, 511; Harvey, Nereis Bor. Am. iii. 49.

This genus appears to have a very extensive distribution; Wulfen and Lamouroux found it on the coasts of Europe, Webb and Berthelot at the Canaries, Professor Harvey in Australia, Gaudichaud in Rawak and the Sandwich Islands, La Sagra in Cuba, and Martius in the

Brazils. It is to be regretted that the specimens from these different localities have not been critically examined.

Dr. Harvey's character is excellent, viz. root fibrous; frond stipitate, membranaceous, leaf-like, flabellately veined; the veins confluent, radiating from the base to the margins pedately multifid, excessively branched, and everywhere closely anastomosing; fructification unknown.

"As Professor J. Agardh remarks (Alg. Medit. 24), it is related to *Valonia*, from which it differs chiefly in the lateral cohesion of the branches of the generating filament, and to which it bears the same relation that *Codium* does to *Vaucheria*. It is still more nearly related to *Microdictyon*, where the frond orms an open network." Harvey l. c. 49.

Professor Harvey gives an interesting account of the development of the Florida specimens in his 'Nereis Boreali-Americana,' vol. iii. 49.

1. *A. stellata;* frond coriaceous, the cells ovate, narrow at the base, with several diverging cells at the tip, some of which elongate, and are proliferous at their apex; the upper part of the sides of the basal cell, with some large cells placed at right angles with the principal cells; the frond between the main fibres formed of numerous variously-sized cells. — *Lichenoides gelatinosum tenue reticulatum*, Dillen. Musc. 138. t. 19. f. 21. *Ulva stellata*, Wulfen, Cr. Aquat. 6; Jacq. Collec. i. 321; Roth, Cat. Bot. ii. 243, 325. *Anadyomene flabellata*, Lamx. Pol. Flex. t. 11. f. 3; Bory, Nouv. Fl. Pélop. 78. t. 41. f. 5; Kützing, Sp. Alg. 511. *A. stellata*, C. A. Agardh, Sp. Alg. i. 400; Syst. 191; Mart. Fl. Bras. i. 25; Montag. in La Sagra, Cuba, 22; Webb and Berth. Fl. Canar. iv. 180.

HAB. Mediterranean, *Wulfen, spec. in Brit. Mus.* Coast of France, *Lamouroux.*

Var. *Floridana;* larger; midrib more branched; cells oblong, more ovate, not so narrow below.—*A. flabellata*, Harvey, Nereis Boreali-Americana, iii. 48. t. 44; excellent.

HAB. Florida: Key West, *Herb. Harvey and Gray.*

I am by no means certain that the specimens from the coast of France, Florida, Cuba, and Brazil, combined in the above synonyma, are the same species, but I have not sufficient specimens at my command to determine the question.

I have only seen two small fragments of Wulfen's from the Mediterranean that were given to the Banksian collection by Dawson Turner,

and a series of specimens from Florida collected by Professor Harvey, which he most kindly presented to me.

If I could regard these Mediterranean specimens as fair types of the plant usually found there, I should decide that it was distinct from those from Florida. These small fronds only contain a very few large cells, very different in this respect from the Florida specimens, but, on the other hand, the specimen figured by Lamouroux, found in the "Mousse de Corse," more nearly resembles those from Florida, and one can hardly believe that the *Corsican Algæ* he examined could have come from the coast of America.

2. "*A. plicata;* frond plicate; veins subtrichotomous."—C. A. Agardh, Sp. Alg. i. 400; Kützing, Sp. Alg. 511.

Hab. Island of Rawak, *Gaudichaud.*

"Differt a præcedente (*A. stellata*) statura minore, fronde maxime plicata, *venis paucioribus* trichotomis, cum in illa frons tota venis occupata est, hæc magis continua venis quibusdam membranam percurrentibus; habitus omnino *Collematis*."—*C. A. Agardh, Species Algarum*, i. 400, 1823.

3. *A. Cutleriæ;* frond membranaceous; the cells oblong, nearly as wide at the base, with several diverging cells at the upper part, each bearing a similar series of diverging cells at the apex; the frond between the main cells filled up with one or two series of large cells at right angles with their margin.

Hab. Bermuda.

Described from a fine specimen received by Miss Cutler from Bermuda, and presented by that lady to me with the rest of her exotic *Algæ*. I have divided the specimen between the British Museum, Dr. Harvey, and my own collection.

4. *A. Wrightii;* frond imbricated, coriaceous; joints linear-elongate, several times longer than broad, with a radiating group of cylindrical branches at the tip, two to four of which are longer than the rest and proliferous at the tip; the branchlets near the margin five or six, shorter, radiating, of nearly equal length; the interspaces between the branches wide, and filled up with small subequal cells.—*A. Wrightii*, Harvey, mss.

Hab. Loochoo Islands, *C. Wright, King's and Rogers's Exploring Expedition*, 1853 *and* 1856.

Professor Harvey most kindly sent me this species to compare with

Anadyomene Brownii. Its study induces me to propose to divide the genus into two subgenera, thus :—

1. The cells of main stem linear; interspaces between the main filaments and cells close on their sides, filled up with nearly equal-sized minute cells.—STENOCYSTIS, for *A. Wrightii.*

2. The cells of main stem ovate; interspaces between the main filaments filled up with large very different-sized cells.—ANADYOMENE, for *A. stellata* and *A. Cutleriæ.*

Stenocystis is somewhat intermediate between *Anadyomene* and *Calomena,* but it evidently belongs to the genus to which I have referred it, as instead of the main filament being only forked, it is provided with radiating cells at the top.

Genus 3. GRAYEMMA.

Frond fan-shaped from a central root; the main stem and branches in the centre of the frond and lobes formed of three or four parallel close series of short cells in transverse bands.

This genus is very different in its structure from *Anadyomene.* In the latter, the series of cells that form the axis of the frond and its lobes is single, one cell on the end of the other like a *Conferva,* the end cell being crowned with a radiating group of cells.

In *Grayemma* the frond and its lobes are supported by a broad midrib, which is formed of several close parallel longitudinal series of cells, the cells on the side of the midrib giving off radiating groups of cells. The end of the midrib is branched, and is elongated by the development of a radiating group of cells at the end of the former one, and this is how the many series of cells in the midrib are formed, and why they look like what they really are, a continued succession of radiating groups of cells forming a thick midrib; the parietes of the cells are so thin that in the dry specimen the outer surface of the cell is sunk in leaving the side-margin elevated; from the side of the midrib arises a group of diverging cells, and on the apex of these are formed another series as the frond enlarges: thus the branches on the midrib are gradually formed and lengthened.

The disk of the frond between the midribs is filled up with a very numerous series of cells much smaller in size and more numerous than in *Anadyomene,* consequently there is a much greater difference between

the disk of the frond and the main stems than there is between the cells in *Anadyomene*, which is, as it were, all composed of numerous diverging cells only differing in size.

The cells on the upper part of the sides of the main series in *Anadyomene* are furnished with a series of rather large cells placed at right angles with them; there are only a very few very small cells so placed n *Grayemma*, and they are not to be seen except in a few places on the frond.

If the chain of cells of the two genera are compared, it will be found that in *Anadyomene* each cell gives off at the tip a radiating series of cells, some of which being larger than the rest form a branch which at its apex again gives off a radiating group of cells, some of which are similarly elongated and are proliferous, so that the frond is composed of a succession of trifid and in some rare instances four- or more numerously-divided branches. In *Grayemma*, on the contrary, the series of cells remain unbranched as long as they are parallel, and after being parallel for a time some diverge to the left or to the right, and then form another stem, giving off diverging series of cells.

In *Grayemma* the midribs extend almost up to the edge of the frond with a single group of cells, forming a fan at the top quite close to the edge, which is very different from the structure seen in *Anadyomene*.

All the midribs and branches of the specimens I have been able to examine are formed of several parallel close series of cells, except the tips of some of the smaller branchlets, which consist of a series of two or three cells placed one on the other, and ending in cells diverging from the tip of the last one like a fan, except in two cases, one a slender branch, which starts from the midrib and extends to the margin; this branch consists of a single series of cells as in *Anadyomene*, about twice as long as they are broad; and only giving off a short single branch, not dividing into branchlets as in *Anadyomene*. The second example of a single series of cells occurs in a simple branch that runs parallel to the main stem, and at length becomes united to it, and then assumes a compound form. This branch can only be considered as a series of cells that has been accidentally diverted from its proper position in the growth of the plant, and assumes it again, but it shows that the main stems are composed of many single series of cells united into a bundle to form the thick midribs.

1. *G. Menziesii.*

Anadyomene Menziesii, Harvey, Boreali-Amer. iii. 52.

HAB. Gulf of Mexico, *Archibald Menzies, Esq.*, 1802, *in B. Mus.*

(To be concluded in our next.)

A FEW CRITICAL, LITTLE KNOWN, OR OTHERWISE INTERESTING PLANTS.

BY H. F. HANCE, PH.D., ETC.

1. *Capsella pauciflora*, Koch.—This exceedingly rare little thing was first distinguished by the late Professor Koch, who considered it as very different from *E. elliptica*, C.A.M., by its abbreviated few-flowered subumbellate racemes, with a much more slender rachis, its longer fruit-pedicels, and its more branching stem, with the branches bearing from their base leaf-opposed partial racemes. Bertoloni, who belonged to the old school of botanists, and was very cautious in admitting species except on well-marked characters, nevertheless considered this as one, though there is little in his distinguishing phrase (Fl. Ital. vi. 572), to support the opinion. I have not access to Hausmann's Tyrolese Flora, and do not therefore know what are his views with regard to this plant; but I am not aware that, since it was first characterized, any botanist has contested its claim to specific rank, except my friend Dr. Ferdinand Mueller, who writes (Plants Indig. to Victoria, p. 44, sub *Capsella elliptica*), *C. pauciflora*, Koch, seems merely a few-flowered "variety of this species." A careful examination of excellent specimens from the Val Vestina, in the Italian Tyrol, for which I am indebted to the kindness of Professor Parlatore, certainly inclines me to agree with Dr. Mueller; indeed, I can find nothing noteworthy to separate the two so-called species. It is true that *C. elliptica* is usually taller and less branched from the base, but Heldreich's specimens from the Phaleron, near Athens, are quite as ramose from the very column. With regard to the tenuity of the rachis, and the length of the fruit-pedicels, I can detect no difference whatever between the Tyrolese plant and authentic German specimens of *C. elliptica*, γ. *integrifolia*, given me by Professor Mettenius. The few-flowered racemes, upon which stress is chiefly laid, certainly cannot

be depended on; for, while the lower axillary ones are usually abbreviated and 3–4-flowered, the upper, terminating the branches, have frequently as many as 12 flowers, and are not in the least umbelliform. In fact, many of Dr. Thomson's Western Tibetan specimens of *C. elliptica*, which are referable to the var. *integrifolia*, are quite as depauperate in regard to inflorescence as the most marked examples of *C. pauciflora*. The main difference seems to me to be the usually leafless leaf-opposed (or axillary?) lower racemes; but they are not always absolutely leafless, and this character may reasonably be attributed to their abbreviation. From the above considerations, I believe the plant in question must be regarded as a modification of *C. elliptica*, var. *integrifolia*, which has acquired a peculiar, often pendulous habit, from growing in shaded, humid, alpine localities.

2. *Camellia Hongkongensis*, Seem. Of this plant an excellent plate has been published by Dr. Seemann (Linn. Trans. xxii. t. 60), but I infer from his paper, and from Mr. Bentham's description in the 'Flora Hongkongensis,' that neither of these authors has seen the ripe fruit, which Colonel Champion vaguely described as *glabrous*. I have recently had an opportunity of examining five or six fresh ripe capsules, and find them to be spherical, about 2¾ inches in circumference, cinnamon-coloured, and densely furfuraceo-scabrous on the surface; the seeds are a little larger than those of the Tea-plant. I quite agree with Mr. Bentham and Dr. Hooker in reducing *Thea*, even as amended by Seemann, to *Camellia*.

3. *Sterculia lanceolata*, Cav. The seeds of this shrub are occasionally, though rarely, met with, still enclosed in the brilliant scarlet follicles, in the Hongkong markets. They are eaten, roasted or boiled, exactly in the manner of the common Chestnut.

4. *Trifolium flavescens*, Tineo. This species, which was described by Presl under the name of *T. villosum*, was afterwards correctly referred by him, and also by Savi, to the *T. pallidum*, W. and K. Gussone, however, is unwilling to admit their identity, and writes (Flor. Sic. Synops. vol. ii. pt. 1. p. 331), "Differt a *T. pallido*, W. et K., habitu magis diffuso, capitulis omnibus sessilibus, corollis semper ochroleucis, leguminibus 1-spermis, non 2-spermis, tubi calycini fauce non prominula." I have made a very careful comparative examination of excellent specimens of *T. pallidum*, from Istria and the Banat, the latter gathered by Heufell, and Sicilian ones of the so-called

T. flavescens, and am constrained to remark that the differences mentioned are purely imaginary. Any botanist might be safely challenged to separate correctly Sicilian and Hungarian specimens which had been mixed together, with private marks attached, to distinguish them; and MM. Grenier and Godron, whilst admitting *C. flavescens* (Fl. de France, i. 407), give the "calice à tube dépourvu d'anneau calleux à la gorge" as the sole distinction. It is possible that in Sicily the plant has *always* yellow flowers, but this is a character of little value, for *T. pallidum* has always been recognized as variable in this respect. Koch says, "flores albi vel colore roseo suffusi;" Visiani, "flores albidi vel colore roseo suffusi;" and from *albidus* to *flavescens*, or *luteolus*, as Bertoloni describes it, the transition is very slight. Besides which, a precisely identical variation is met with in *T. incarnatum*, L., wild British specimens of which are always yellow-flowered; and the blossoms of the common *T. pratense*, L., vary from rosy-purple to white or yellow. As to the callous ring, which appears to be mainly relied on as a ground of discrimination, I have been quite unable to find such in either. The calyx-tube has a dense annulus of fulvous hairs inside, but I do not see any callosity, properly so called, even after careful softening in boiling water, and with the aid of a powerful lens; but it is very probable that the line where the ring originates does become more or less thickened in the advanced fruit-calyx, which I have not had the opportunity of examining. The flowering calyx-tubes of both the Hungarian and Sicilian plants certainly appear quite similar. Hence, I quite concur in Bertoloni's judicious observation (Fl. Ital. viii. 166), "Conlatis pluribus exemplaribus *T. pallidi*, Fl. Hung. (sphalmate typog. *pallescentis*) et *T. flavescentis*, Tin., nullam essentialem differentiam inter ea inveni. Color corollæ et annulus callosus in fauce tubi calycini idem habetur in utroque, sed annulus est visibilior in calyce fructifero. Recte igitur Preslius conjunxit has plantas." I do not, indeed, see how they are to be regarded even as distinct varieties.

5. *Trifolium ovatifolium*, Bory et Chaubard. Bertoloni, I believe, is the only one who has asserted the identity of this plant with *T. alatum*, Biv. (=*T. Cupani*, Tin.), and I do not know that any writer has confirmed his statement. I have carefully compared Sicilian specimens with others of *T. ovatifolium*, gathered in Caria by Pinard, and am quite satisfied Bertoloni's opinion is correct.

6. *Mentha Javanica*, Bl. Chinese oil of peppermint has a great reputation in the East; and certainly, in my judgment, it is quite equal, if not superior, in the strength and diffusiveness of its odour, and in flavour and pungency, to the best European samples I have ever seen. It is extensively employed in all manner of complaints by the native practitioners; for instance, in colic and tympanitis a little is rubbed round the umbilicus, with, in most cases, marked advantage, and in some kinds of headache, friction with it on the forehead and temples affords speedy relief. A particular kind, sold in the Canton shops, contains such a great excess of stearoptine that, except in very high temperatures, it is absolutely solid, consisting exclusively of acicular crystals. The cultivated plant which was brought to me as the source of the oil, and which, on my expressing some doubt on the matter, I was assured here (at Whampoa) was undoubtedly the genuine herb, proves on examination to be *Mentha Javanica*, Bl., a plant which, as noted in the 'Flora Hongkongensis,' I had some years ago found growing in ditches at Saiwan, certainly truly wild. I have no means of verifying the asserted origin of the Chinese oil, but apart from the question of the specific distinctness of this from *M. arvensis*, L., it would be interesting to know whether in Europe any attempt has been made, and with what success, to extract peppermint-oil from the latter species. Endlicher (Enchir. Bot. 309) does not include it in the list of his officinal and "usual" Mints, nor is it alluded to in Professor Lindley's 'Medical and Economical Botany;' and Dr. R. E. Griffith, at page 504 of his 'Medical Botany,' published at Philadelphia in 1847, says, "the species peculiar to the United States" (including therefore the very closely-allied *M. Canadensis* reduced to *M. arvensis* by Bentham), "are seldom employed, as both their odour and taste are not as aromatic and pleasant as the naturalized."

7. *Ficus stipulata*, Thbg., and *F. pumila*, Thbg. These two species appear to be very little known to European botanists, for Professor Miquel, when publishing his 'Prodromus Monographiæ Ficuum,' in 1848 (Hook. Lond. Journ. Bot. vii. 439), merely quotes Kæmpfer and Thunberg as authorities for *F. pumila*, which he had then apparently never seen; and even as late as 1861, Mr. Bentham states, in the 'Flora Hongkongensis,' that the Hookerian herbarium contained no amphanthia of *F. stipulata*. This plant is by no means uncommon in Southern China, [I collected it on the walls of Canton—B. SEEMANN,]

though I do not remember ever seeing it in Hongkong. But though not unfrequent, it is certainly rare to find other than barren specimens. It adheres to the faces of rocks, and the sides of the Ω-shaped Chinese tombs, but scarcely any flowers, because, apparently, there is not in such localities sufficient space for its development. Hence, I had for years been tantalized by the fruitless search for receptacles, though the plant itself was not difficult to find. The sterile branches invariably produce only small leaves (6–12 lin. long), for both the plants under consideration have "folia dimorpha;" but when it secures sufficient space, the flowering branches with their large leaves (3–4 poll. long) are plentifully developed, and the plant produces figs in abundance. These are of a roundish-turbinate form, about $2\frac{1}{8}$ in. long, quite flattened and sericeous at the top, with a protuberant umbo. I have at Macao seen old walls covered with this plant, climbing upwards of 30 feet high, and extending indefinitely in a lateral direction, the branches adhering to the stone like our Ivy in Europe, and so loaded with figs that I could easily gather forty or fifty good specimens in a few minutes, with the help of a ladder. I have had the pleasure of sending specimens to different European herbaria. [It has frequently flowered in the garden of Herrenhausen, Hanover.—EDITOR.] The Fig, I should add, is not edible, or at least, so far as I can discover, *not eaten*, but is sold in the Chinese herbalists' shops, amongst the very indiscriminate constituents of the Celestial 'Materia Medica Vegetabilis,' and is used as an external emollient application to painful hæmorrhoidal tumours.

F. pumila I have never seen alive, but I possess a specimen of Japanese origin, which I may undoubtedly consider authentic, since it was given me by Professor Miquel from the Leyden herbarium. This species is apparently quite undistinguishable in foliage from *F. stipulata*, but may be at once known by its ovoid fruit, scarcely more than an inch long, strikingly different, therefore, in size and shape. Mr. Swinhoe has sent me a plant which I cannot but refer to this species, gathered at Takow, in the island of Formosa, which differs only, in the dried state, from that of Professor Miquel by its rather more elliptic syconus. Mr. Swinhoe informs me that the Fig is called by the Chinese in Formosa *Aw-keo-tsang*, and is eaten with sugar after being soaked in water. Endlicher also (Enchir. Bot. 166) enumerates *F. pumila* amongst the esculent species; whilst, on the other hand, Thun-

berg (Flor. Jap. 33) distinguishes his *F. pumila*, β. (=*F. erecta*, Thb. serius, and of subsequent authors) from the true *F. pumila*, by its edible fruit. But, to say nothing of his very imperfect means of acquiring information, the fact of a fruit not being generally eaten by no means disproves its wholesomeness; and, indeed, Thunberg himself at first considered his two later species inseparable.

Doubtless *F. stipulata* and *F. pumila* are very closely allied species, so near, indeed, that I cannot myself pretend to distinguish sterile specimens. M. Schultes, in a rather scarce work ('Hoffmann et Schultes, Noms indigènes d'un choix de plantes du Japon, déterminées d'après les échantillons de l'herbier des Pays-Bas,' Paris, 1853), reprinted from the 'Journal Asiatique,' remarks under *F. stipulata*:—"Les échantillons de cette espèce conservés dans l'herbier portent les mêmes noms japonais et chinois que *F. pumila*, et elle ne paraît être qu'un drageon de *F. pumila*." Whatever error may exist in the nomenclature of the herbarium specimens referred to, no botanist who has examined the syconi of the two species would, I imagine, for a moment think of uniting them.

8. *Catapodium unilaterale*, β. *aristatum*, Grisebach. I am indebted to the well-known Sinologue, Dr. S. W. Williams, at present Secretary to the United States' Legation at Peking, for specimens of this pretty little grass, found sparingly by him, in July 1864, in damp places by the borders of fields, about twelve miles west of the capital. It had previously been recorded from the mountains of northern China, by Bunge. I notice it for the purpose of alluding to its presence in Peking as a singular instance of geographical distribution, for it is found neither in Dahuria, Mongolia, in the Ussuri or Amur territories, nor in any part of the whole Russian empire, except perhaps the Crimea; and its occurrence there rests only on the doubtful testimony of Georgi. It may, at first sight, seem strange that a grass which is mainly confined to the south of Europe should be found at Peking, where the thermometer in January sometimes falls as low as 17·6° F., and where the advent of a rigorous winter is heralded by piercing northerly winds, and accompanied by the almost entire disappearance of herbaceous vegetation; but fugacious plants like this, which only exist for a short time in the height of summer, are not exposed to such inimical influences. The mean temperature of Peking, calculated from thirteen years' observations, according to Kuppfer, as quoted by Maxi-

'mowicz, is, when reduced to Fahrenheit's scale:—Winter, 29·4°; spring, 51·8°; summer, 68·8°; autumn, 50·4°. The mean summer temperature is quite similar to that of several of the European localities where the grass is met with, as will be seen from the following list, reduced to Fahrenheit's scale from Mahlmann's tables, given in the third volume of Humboldt's 'Asie Centrale:'—Paris, 64·6°; Turin, 71·6°; Naples, 74·8°; Marseilles, 69·2°; Madrid, 74·1. M. Godron (Gren. et Godr. Fl. de France, iii. 616) has the following observation under the genus *Nardurus*, to which he refers this plant:—"C'est en 1844 que j'ai créé ce genre, sur la simple indication que m'a fournie Reichenbach, en publiant une des espèces sous le nom de *N. enellus*. Depuis, M. Boissier, qui sans aucun doute ne connaissait pas l'existence de ce genre, l'a admis dans son 'Voyage botanique en Espagne,' et, chose remarquable, sous la même dénomination." Now, in the 'Flora Germanica Excursoria,' published in 1830, Reichenbach had already remarked under *Brachypodium tenellum*:—"Gramen habitu fere *Nardum* referens, *Nardurus!* gen. propr., quasi *Vulpia* spicata;" and in the second edition of Bluff and Fingerhuth's 'Compendium Floræ Germaniæ,' published in 1836 (I have not the first to refer to), the aristate and muticous-flowered varieties of this group will be found divided between two sections, *Nardurus* and *Catapodium*. I have adopted the latter name, because the plant I am writing of seems to associate naturally with *C. loliaceum* (the oldest generic name), which is however placed in a separate tribe by Godron. In the present unsatisfactory condition of agrostography, the limits between various Triticoid and Festucoid genera, and especially the value of the numerous small groups split off from *Festuca* and its allies by Grisebach, Ruprecht, Parlatore, and others, cannot be determined, and we must await the promised revision of this vast and very difficult family by Colonel Munro, before we can expect to see the existing class reduced to order.

Whampoa, S. China, September, 1865.

THE FUTURE VEGETATION OF AUSTRALIA.

As soon as New Holland shall have been broken up into islands [as Unger predicts it will be], we may expect its vegetation to assume the

same aspect as that now presented by the Polynesian islands. The bulk of the plants, adapted as they are to the peculiar dry climate of the extratropical parts, would perish as soon as the climate became insular, and the Asiatic flora, which even now presses hard upon the northern parts of New Holland, would get the upper hand, as has been the case in the Pacific after the dissolution of its continent into those innumerable islands now called Polynesia. Plants with dry leathery leaves would be superseded by those having a more luxuriant but weedy look; for that I take to be the principal physiognomic difference between the floras of extratropical Australia and tropical Asia. It must be evident that the inquiry Unger has set on foot [about the former continental connection of Europe and Australia] cannot stop here. The abundance of the most typical forms of Australian mammals—the marsupials (opossum and kangaroo)—in tertiary European deposits, will doubtless tempt some comprehensive mind to treat the subject from a zoological point of view. It is most important to ascertain whether the present fauna of Australia was always associated with the present flora. I do not know of any reason why it should not; but a closer examination of all the facts may possibly point to a different conclusion. It will probably turn out that in the Australian native population we behold the oldest as well as the lowest race of men—a race in many instances without any religion whatever, and incapable of mastering any religious teaching,—a race unfitted for civilization, and so near the brute creation that it might be appropriately classed with it, if it was not for its power of language and the only ingenious thing in its possession—the boomerang. The reasons why New Holland could not make any great strides in civilization, conceding even that the natives as a race were capable of it, are easily found in the nature of the country. It wants moisture and nutritious plants for man and beast. Extensive tracts of land are required to feed even a flock of sheep; wild animals are scarce; and whilst every other part of the globe has added edible plants to our table, we have not received a single addition from New Holland; indeed, Europeans who should have to rely for their food upon what Australian vegetation can supply, would share the melancholy fate of Burke and Wills when they tried to eke out their existence by eating the wretched nardoo-fruits of Australian swamps. There could be no flocking together of men as long as these conditions were not remedied, no permanent interest in

property, and no improvement. All was hopeless stagnation. But if, under these unfavourable conditions, man has existed in Australia, at least as far as we *historically* know, for several centuries, we may conclude that he *could* exist in Europe, even during the Eocene period, when the same, or a closely similar climate, vegetation, and perhaps fauna, prevailed there. We may also be sure that, with such surroundings, whatever his race may have been, he could not have arrived at a much higher degree of civilization than the miserable aborigines who are now disappearing in Australia.

Bearing in mind that, at one period of the earth's history, there flourished in Europe a vegetation very similar, not to say identical, to that still beheld in Australia; but that the whole of it has been swept away, to make room for other vegetable forms, leaving no trace behind except what is recorded in the great stone-book of nature, New Holland is highly instructive. It is a faithful picture of what the aspect of our flora must have been ages ago; and on paying a visit to Australia we are, as it were, transporting ourselves back to antehistorical periods. The effect which such an inspection produces on the mind is very singular. It kindles in us (and I speak from personal experience) feelings of curiosity, but no sympathy. We delight in bright green foliage, sweet-smelling flowers, and fruits with some kind of taste in them. But we have here none of all these. The leaves are of a dull, often brownish, green, and without any lustre, the flowers do not smell, and the fruits, without any exception, are tasteless and insipid. Is the whole of this vegetation, and the animals depending upon it for support, to disappear before the continent becomes a fit abode for the white man?—B. SEEMANN, in 'Popular Science Review,' 1866, p. 26.

ERICA TETRALIX IN AMERICA.

Professor Reichenbach calls attention, in the Gardeners' Chronicle, to *Erica Tetralix*, as indicated in his father's 'Flora Germanica Excursoria,' p. 143, sub n. 2774, having been collected in Dutch Guiana by Weigelt. He states that he possesses himself one of Weigelt's specimens. Now that we have dispelled every doubt about *Calluna vulgaris* being indigenous to the New World, the question is worth re-examining.

VARIEGATED FOLIAGE AND DOUBLE FLOWERS NOT OCCURRING TOGETHER.

Professor E. Morren maintains that variegated foliage and double flowers never occur together on the same plant. He explains the fact that variegated leaves (the partial disappearance of chlorophyll) is a proof of weakness, whilst doubling of flowers is a proof of strength, and as both these conditions cannot possibly occur at the same time, variegated leaves and double flowers on one and the same plant are an impossibility. Bull's variegated *Camellia Japonica*, figured in our last number (tab. 42), is a case in point. Whilst all other *Camellia Japonicas* of our gardens have green leaves, and either double or semi-double, but never single flowers, this variegated kind has flowers with the five normal petals only. An apparent exception to Prof. Morren's hypothesis is presented by *Kerria Japonica*. Of this plant two varieties have recently been introduced into our gardens, but it is suspected that plate 336 of the Illustr. Horticole, on which they are figured, was made up by the artist taking the varieties with variegated leaves, and sticking on to them the double flowers of the ordinary green-leaved variety.—B. Seemann.

NEW PUBLICATIONS.

Neue Untersuchungen über Uredineen, insbesondere die Entwickelung der Puccinia graminis. Von A. de Bary. (Reprinted from the Proceedings of the Berlin Academy for 1865.)

Dr. de Bary commences with a recapitulation of his former observations (Ann. des Sc. Nat. xx. p. 1), which were directed to show that certain species of *Uromyces* and *Puccinia* exhibit five different sorts of reproductive organs. These organs are, first, *spores*, or as the author proposes to call them, *teleutospores*, which germinate and produce what has been called a *promycelium*, upon which the second kind of reproductive organ, viz. the *sporidia*, are borne. The *sporidia* germinate and produce the *Æcidia*, with their constant companions (or forerunners) the *spermogonia*, the functions of which are not as yet ascertained. The spores of the *Æcidia* germinate, and the filaments pass through the stomata, and only through the stomata, into the tissue of the nutrient plant, where they form a new *mycelium*. This produces at

once the fifth form of fruit, the *uredo*. Lastly, the same mycelium which produces the *uredo* ultimately yields the *teleutospores*, which in some species of *Uredineæ* are found on the same fruit-layer with the uredo-spores, in others in special fruit-layers.

Æcidium and *Uredo* (as is well known) have been hitherto considered genera. De Bary observes that the names may be retained as descriptive of the organs, but that the genera must bear the names hitherto applied to the *teleutospores*.

The author remarks that it is hardly to be doubted that the cycle of development, commencing with the germination of the *teleutospores*, exhibiting the stages of *promycelium*, *sporidia*, *Æcidia*, with *spermogonia*, and *uredo*, and thus returning to the *teleutospores*, is probably the same, or nearly so, in all the *Uredineæ*.

But many species of *Puccinia* and *Uromyces* seem never to produce an *Æcidium*, and inhabit plants upon which *Æcidia* are never seen. The question thus arises whether the *Æcidium* stage is suppressed, or is it to be sought for elsewhere.

Dr. de Bary selected *Puccinia graminis*, P., for special study, with the view of determining this question, and he has carried out a series of careful experiments (for the details of which we must refer to the paper itself) which have satisfied him that the *sporidia* of *Puccinia graminis* germinate on the leaves of *Berberis*, and that the *Æcidium* of the *Berberis* is a stage in the cycle of development of that *Puccinia*.

Thus, whilst in most *Uredineæ* the entire development is carried out upon one and the same nutrient plant, the alternations of generation in *Puccinia graminis* require a change of host.

This (Dr. de Bary observes) is a peculiarity to be especially remarked, and he proposes to call those parasites whose metamorphosis and alternations of generation require a change of host, *heteræcious*, and those whose whole development is carried out upon the same host, *autæcious*. This *heteræciousness* (so to speak) is well known in the animal kingdom in the *Tæniæ* and *Trematoda*, but *Puccinia graminis* is the first of the parasitic fungi in which it has been certainly ascertained. The author indicates several of the *Uredineæ* (*Melampsora*, *Phragmidium*, etc.) which, although yielding *sporidia*, *uredo*, and *teleutospores*, exhibit no *Æcidia*, but on the other hand several *Æcidia* of which the other stages are quite unknown.

We may add that the paper contains a somewhat full account of the

different opinions which have been promulgated from time to time upon the much-disputed question as to the supposed injurious effect of the proximity of *Berberis* to corn, a notion very prevalent amongst agriculturists, and hitherto somewhat laughed at by scientific men. If Dr. de Bary's observations are confirmed, it will be impossible to deny that the agriculturists have been in the right.

The Treasury of Botany, a Popular Dictionary of the Vegetable Kingdom, with which is incorporated a Glossary of Botanical Terms. Edited by John Lindley, Ph.D., F.R.S., F.L.S., and Thomas Moore, F.L.S., assisted by numerous contributors. In two parts. London: Longmans.

This companion volume to Maunder's 'Treasuries' must be welcomed as a useful book of reference on popular matters relating to the vegetable kingdom, and supplies a long-felt desideratum. Its object is to give a familiar and concise account of every genus of plants, with special reference to those species, useful, ornamental, or curious, on which information is likely to be sought by the general public; and it is but just to acknowledge that this object has been fully attained. The work is arranged alphabetically, and illustrated by numerous woodcuts and twenty beautiful steel engravings. A glossary of botanical terms is also embodied, and some notion of the geography and physiognomy of plants may be gathered from the introduction, written by Dr. Seemann, and intended as a commentary of Mr. Adlard's truly exquisite steel-engravings. The plan of the work was sketched out by the late Dr. Lindley, who, in conjunction with Mr. Thomas Moore, became the editor. But he was not able to exercise his functions further than the letter C, and long ere the printing of the whole work was completed, he died, leaving the task of revising the sheets through the press, verifying names and references, and supplying innumerable gaps, to his able coadjutor, Mr. T. Moore; and we are happy to be able to add that the latter has acquitted himself of his gigantic task in a manner deserving of the greatest praise. The proofs have been read with the utmost care, though the type employed is very small, and thousands upon thousands of strange names of plants, places, and people occur throughout. True, Mr. Moore had eighteen able contributors, but most of them were men so busily engaged in other

studies that we wonder how they could possibly manage to throw off so many valuable articles, and we suppose the editor had to write no end of polite notes requesting additional supplies of manuscript at their earliest possible convenience. All the articles, with the exception of the editorial ones, are signed, and they are contributed by the following botanists, viz. Professor Balfour, Rev. M. J. Berkeley, Mr. A. A. Black, Mr. W. B. Booth, Professor Buckman, Mr. W. Carruthers, Mr. B. Clarke, Professor Dickie, Mr. W. B. Hemsley, Mr. R. Heward, Rev. C. A. Johns, Dr. Masters, Dr. Moore, Mr. T. Moore, Dr. Seemann, the late Mr. Alexander Smith, Mr. J. T. Syme, Mr. R. Thompson, and Mr. W. Thompson.

Annotationes Criticæ in Cupuliferas nonnullas Javanicas. Auctore C. A. J. A. Oudemans. Amstelodami. 1865. 4to, pp. 29. Cum Tab. XII.

The Oaks of which Professor Oudemans here makes mention, were for the most collected by Junghuhn in Java, and the detailed comparison he has been able to make of them with other specimens in the Royal Herbarium, in that of the University of Leyden, and in that of Professor Miquel, have enabled him to correct the synonymy and give more accurate and copious details of some of these puzzling plants. Two new species are described, viz. *Q. conocarpa* and *Lithocarpus scutigera*. Twelve lithographed plates accompany the descriptions, to which is also added an analytical table of the Oaks of Java arranged chiefly according to the peculiarities of their fruits.

BOTANICAL NEWS.

'The Natural History Review,' one of the most ably-conducted journals of this country, advocating Darwinian views, has been discontinued.

Mr. Baker, of Thirsk, has been appointed first assistant of the Kew Herbarium.

The Ray Society announces for immediate publication the first volume of Robert Brown's collected writings, edited by Mr. J. J. Bennett, F.R.S.

Count Hermann of Solms-Laubach is now staying in London, preparatory to a botanical journey to Portugal, undertaken chiefly with the view of studying the nature of parasitical plants, in which he is interested, and about which he has published some valuable papers.

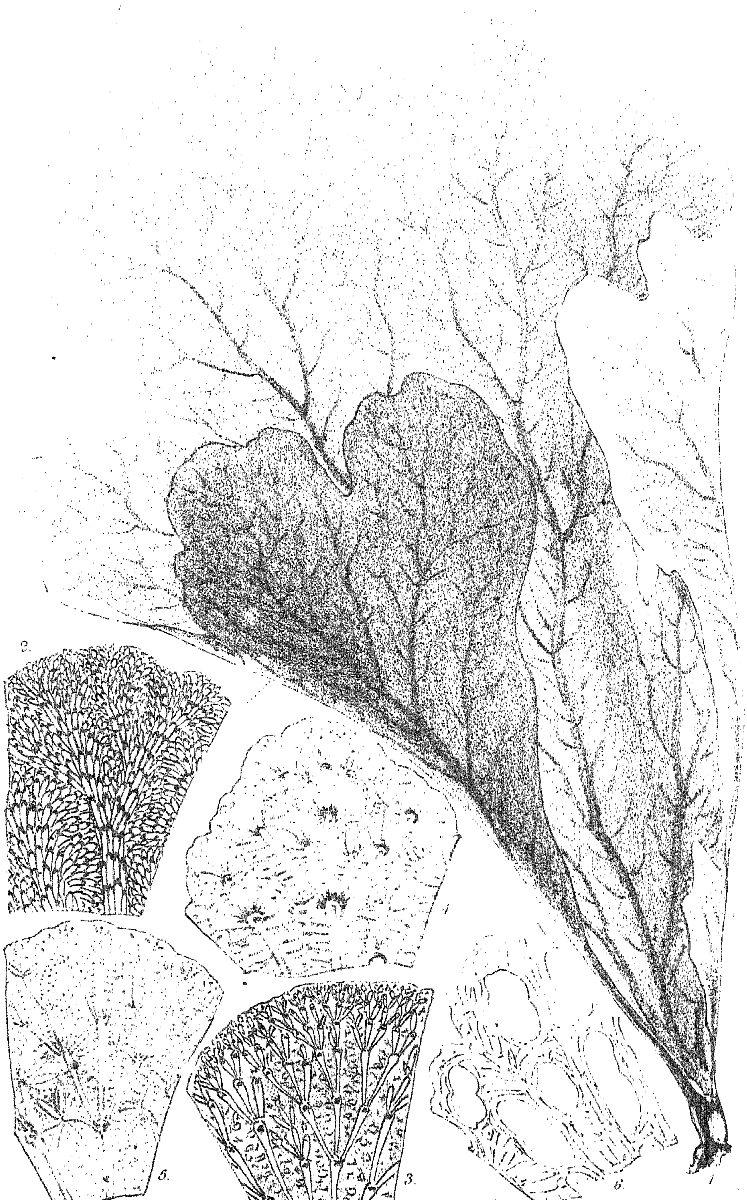
A most important point has been gained by the promoters of the International Horticultural Exhibition and Botanical Congress by the Lord Mayor, Alderman, and Court of Common Council of the City of London unanimously granting the use of the Guildhall for holding, on the 22nd of May, the great banquet projected. For the information of our foreign readers, we may add that this hall is the largest in London, and has never before been used for any similar banquet. A report has also reached London that the Russian Government intends to invite the leading horticulturists and botanists to hold their show and meeting, of 1867, in St. Petersburg, to facilitate which steamers and railways would be placed at the free disposal of the foreign guests.

Dr. Henry Trimen and Mr. W. Thiselton Dyer are collecting materials for a Flora of Middlesex, on the plan of the Essex and Cambridge Floras; and they would feel obliged for notes of localities or any other matter (even the slightest) relating to the subject. In the case of doubtful or critical species, scraps sufficient for identification would be most acceptable. Address, "Dr. Trimen, 71, Guildford Street, Russell Square, London, W.C.;" or "Mr. Thiselton Dyer, Christ Church, Oxford."

We regret to have to announce the death of Mr. Thomas Bridges, well known by his extensive botanical explorations of many parts of America, who died on the 9th of November last, whilst returning from a scientific exploration of Nicaragua. He was a son-in-law of the late Mr. Hugh Cuming.

The death of the veteran botanist, Dr. Jean François Camille Montagne, Member of the Institute of France, and one of the most eminent cryptogamic botanists, is a great loss to science. He was born on the 15th of February, 1784, at Vaudoy, went to sea at the age of fourteen, afterwards accompanied the French army as clerk to Egypt, then returned to France, studied medicine, entered the army as a surgeon, and rapidly rose to the head of his profession. After retiring, he devoted all his energy and leisure to cryptogamic botany, and on the death of A. Richard, in 1858, he was elected a Member of the Institute. He died on the 9th of January, leaving behind a solid scientific reputation.

To our obituary list of 1865 must also be added the name of Mr. A. A. Black, who was for some years Curator of the Kew Herbarium, and in 1863 was appointed Superintendent of the Bangalore Botanic Gardens. He remained at his post till November last, when he went to Rangoon on a visit to his brother. There it was found that his constitution was fast breaking up, and that nothing could save his life but an immediate return to England. He was to remain a month at Rangoon, and in the meantime an opportunity presented itself of visiting the Andaman Islands, of which both he and his brother availed themselves. They left on the 29th of November, and on the 4th of December Mr. Allan A. Black was no more. He was buried on one of the Cocos, amongst the luxuriant foliage of the tropics. He contributed a few short articles to this Journal, and to the tenth volume of the 'Bonplandia' the most complete list of Japan plants ever brought out. He was also one of the contributors to Lindley and Moore's 'Treasury of Botany.' He knew plants well, and it is to be regretted that his failing health prevented him from turning his knowledge to better account.



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ON ANADYOMENE AND MICRODICTYON, WITH THE DESCRIPTION OF THREE NEW ALLIED GENERA, DISCOVERED BY MENZIES IN THE GULF OF MEXICO.

By Dr. J. E. Gray, F.R.S., V.P.Z.S., F.L.S.

(*Concluded from p.* 51.)

(Plate XLIV.)

Group II. Microdictyonemeæ.—*Frond reticulated, formed of a number of regularly-disposed anastomosing cells, leaving four-sided apertures between them, each side being formed of a single cell; the main filament articulated, each joint throwing out opposite branches at right angles to each other, which are similarly branched; the cells containing endochrome.*

I have already stated that I believe this group to be nearly related to *Cladophora* among the *Confervaceæ*.

The filiform stem and the filiform axis or midrib of the frond in both genera give off opposite branches; the midrib and its branches in the frond give off cells on each side, placed opposite each other on the sides of the stalk, and the spaces between these cells are filled up with cells like those of which the joints of the filament are composed, making the whole frond into a beautiful net with polygonal open meshes.

M. Montagne figured *A. Calodictyon* on t. 8. f. 1 of Webb and Berthelot's work, 1850. He observes, "La couleur et la nature des filaments articulés et anastomosés qui forment toute cette algue ont beaucoup d'analogie avec celles des filaments de la *Conferva prolifera;* je vois quelque analogie entre ce genre et le genre *Flabellaria,* Lamx., que je crois très-bon à conserver." M. Montagne figured a central part of the *Alga,* and also a part near the circumference of the frond, showing that the terminal ramifications are free, forming "un bord déchiqueté et frangé," gradually anastomosing upon it; see t. 8. f. 1. c', c''.

The group consists of two genera:—

Genus 1. Microdictyon.—Frond funnel-shaped or lobed, and proliferous, attached by a subcentral disk; the main filament radiating from centre to centre.

Genus 2. Phyllodictyon.—Frond oblong, free, arising from a

slender branched articulated filament; the main filament simple or forked.

Genus 1. MICRODICTYON.

The frond broad, expanded, concave, umbilicate; affixed by a central disk, often proliferous, supported by slender articulated filaments, which give off branches radiating from one centre to another, forming a large network, the intermediate spaces between the filaments being filled up with a network of anastomosing cells, each side of the mesh being formed by a single cell.

Microdictyon, Decaisne, Arch. du Mus. ii. 115; Kützing, Syst. Alg. 511.

This genus has an extensive geographical distribution; specimens have been described from the Canary Islands in the Atlantic, the Red Sea, the coast of Natal, and various parts of the Australian seas.

"*Microdictyon* is generally a deep-water production, lying at the bottom in 5–10 fathoms, but it sometimes occurs at low-water mark. The species of it are all very similar to each other, and have been found in the tropics of both hemispheres and in the Mediterranean; one is very abundant in Port Jackson, Australia."—*Harvey*, *Nereis Bor. Amer.* iii. 402.

Dr. Harvey, in his generic character, describes "the endochrome as green, thin and watery." Probably he is the only algologist who has observed them growing.

Montagne, in his text to Webb and Berthelot's Hist. Nat. des Iles Canaries, vol. v. 180, describes two species of *Anadyomene* under the name of *A. stellata* and *A. Calodictyon*, and in his specific characters of these species gives the generic distinction of the genera *Anadyomene*, Lamouroux, and *Microdictyon*, Decaisne, viz. "Venis membrana tenuissima connexis," and "Venis membrana nulla connexis."

M. Decaisne proposed the genus *Microdictyon* in a paper on the specimens collected by M. P. E. Botta in Arabia Petræa, in the 'Archives du Muséum, vol. ii. 115, 1841, for a species which he calls *M. Agardhianum* found in the Red Sea near Djedda. He observes, "C'est à ce genre et peut-être à la même espèce qu'il faudra, ce me semble, rapporter l'*Anadyomene Calodictyon*, Montagne. S'il n'en était pas ainsi, le genre *Microdictyon* se composerait de trois espèces, l'une

anciennement décrite par Velley et dont le Muséum possède un fragment rapporté des Iles Sandwich par M. Gaudichaud, à laquelle on pourrait appliquer le nom spécifique de *Velleyanum*, pour rappeler celui du botaniste qui le premier l'a bien fait connaître; l'autre, signalé comme variété du *C. umbilicata*, par M. Agardh, conserverait le nom de *M. tenuius*. Ces changements me paraissent d'autant plus motivés que le caractère tiré de la fronde ombiliquée peut s'appliquer indistinctement à chacune des espèces, aujourd'hui connues, et qui sont: 1. *Hydrodictyon umbilicatum*, var. *tenuius*, Ag. Syst. Alg. 85; 2. *Conferva umbilicata*, Velley, Linn. Trans. v. 169. t. 7; 3. *Anadyomene Calodictyon*, Mont. Pl. Cell. Canar. 180." In the Ann. des Sciences Naturelles, série 2. xvii. 327, M. Decaisne quotes—1. *M. Agardhianum;* 2. *M. Velleianum;* 3. *M. tenuius.*

Endlicher, in his 'Mantissa Botanica, sistens Generum Plantarum Supplementum Tertium,' 1843, places the genus *Microdictyon* with the genera *Hydrodictyon* and *Talarodictyon*, in the family *Hydrodictyeæ*, but the fructification of *Microdictyon* is unknown, and there is no reason to believe that the cells produce perfect netted plants as in the freshwater genus.

Endlicher also refers to the genus *Dictylema* of Rafinesque, *Somiologia*, n. 54, as a synonym of the genus.

Professor Endlicher refers to three species of the genus:—

1. *M. Agardhianum*, Dec. 64.—*Hydrodictyon umbilicatum*, var. *tenuius*, Agardh, Syst. 85. Mare Rubrum.

2. *M. Velleyanum*, Decaisne, l. c.—*Conferva umbilicata*, Velley in Linn. Trans. v. 169. t. 7, ad insulas Sandwichenses.

3. *M. Montagneanum*.—*Anadyomene Calodictyon*, Montagne, Flora Can. Plant. Cell. 180. Mare Atlanticum.

It is to be observed here, that though the names of two are quoted as Decaisne's, he has changed two of them.

M. Decaisne, in his paper above quoted, believes there are three species, but he does not attempt to give any characters to distinguish them, except the localities where they are found; and Professor Harvey, though he found three species, gives a name only to one of them, which he regards as similar to those described by Montagne from the Canaries. Kützing, in his Species, in p. 512, gives specific characters for *M. Agardhianum* and *M. Calodictyon*, copied from Montagne, who gives it to distinguish from his *Anadyomene*. Unfortunately I am

not able to examine either the species discovered by Botta in the Red Sea or the one found in the Canaries, as there are no specimens of them in the British Museum or my own collection, which only contains the species discovered in Natal by Dr. Krauss, and the three species collected by Professor Harvey in Australia and the Tongan Islands.

The four specimens in the British Museum appear to be very distinct species, but it is very difficult to distinguish them in words; this difficulty partly arises from the very imperfect state in which they are,—a defect generally incidental to Chlorospermous *Algæ* in a dried state, and especially to *Algæ* of such a tender and fragile nature as the genus under consideration.

In the following schedule I commence with the three species named by Decaisne, of which I know nothing except what is contained in the works quoted.

* *Frond umbilicate, affixed by the centre.*

1. *M. Velleyanum;* frond expanded, fan-shaped, fixed in the centre; filaments very minute, slender; cells longer than broad; the colour blackish when dry, sombre green when fresh.—*C. umbilicata*, Velley, Linn. Soc. v. 169. t. 7. (1799). *Hydrodictyon umbilicatum*, Agardh, Syst. 83. *M. Velleyanum*, Decaisne, Arch. du Mus. ii. 117 (1834); Ann. Soc. Nat. ser. 2, xvii. 327; Endlicher, Mantissa, ii. 1843. *M. Agardhianum*, Decaisne; Harvey, Algæ Austral. Exsiccatæ, n. 568.

HAB. Australia: New South Wales, on the stem of a large fucus, Governor Hunter, *Velley;* Harvey, 'Phycologia Australica,' t. 50. Sandwich Islands, *Gaudichaud;* abundant in Port Jackson and Paramatta River, *Harvey*.

Decaisne established this species from Colonel Velley's figures and descriptions, and from a fragment that M. Gaudichaud brought from the Sandwich Islands, which is in the herbarium of the Jardin des Plantes at Paris.

2. *M. Calodictyon;* filaments moderately thick.—"Fronde solitaria, suborbiculari e viridi fusco nigrescente, cribrosa, margine dissecta lobataque; venis quinis, mediis erectis, binis inferioribus patentibus (vel deflexis) membrana nulla annexis. *Discus* mamillatus scutatus, excentricus, hinc *Alga* umbilicata. *Frons* solitaria, planiuscula, diametro uncialis, margine erosa et irregulariter dissecta, tenuissima, tota venis compositis, pellucidis, confervoideis, primariis quinis, quorum tres medianæ exsertæ, binæ venæ inferiores horizontali-patentes cum secundariis quam

plurimis inter seseque anastomosant, nec ut solemne est in congeneribus membrana ulla conjuncta sunt.—*Montagne in l. c.* *A. Calodictyon*, Montagne in Webb and Berthelot, Fl. Canar. iv. 180. t. 8. f. 1 (1850). *M. Agardhianum*, Decaisne, Arch. du Mus. ii. 115, 117, not Endl. *M. Montagneanum*, Endlicher, Mantissa, ii. 14. *M. Calodictyon*, Decaisne; Kützing, Sp. Alg. 512.

HAB. Atlantic Ocean, Canaries, *Webb and Berthelot.*

2. *M. Montagnei;* filaments moderately thick, the colour white or yellowish when dry.—"*Microdictyon Montagnei*," Harvey, Algæ Insul. Amicorum Exsicc. n. 89.

HAB. Friendly Islands, *Harvey*, *Herb. Brit. Mus.*

The specimen of *M. Montagnei*, no. 89, from Professor Harvey's collection, of specimens of Australian *Algæ* in the British Museum, is very distinct in the large size of the cells, in the distribution of the branches, and in the colour of the dried specimens, from the other Australian and the Natal specimens in the Museum.

3. *M. Kraussii;* filaments very slender, filiform; frond flat, divided into wedge-shaped lobes from a central disk, having several more or less imbricate lobes at the centre; colour blackish when dry; *Calodictyon.*—*M. Velleyanum*, "Decaisne;" Krauss, Pflanzen des Cap- und Natal-landes in Flora, 1846, 215, "in Batav. 210."

HAB. S. Africa: Natal, *Krauss*, n. 273, *Herb. Brit. Mus.*

** *Frond flat, foliaceous, imbricate at the base.*

4. *M. tenuius.*—*Hydrodictyon umbilicatum*, var. *tenuius*, Agardh, Syst. Alg. 85. *M. tenuius*, Decaisne, Ann. Sc. Nat. 2 ser. xvii. 327. *M. Agardhianum*, Endlicher, Mantissa, 14, not Decaisne.

HAB. Red Sea, Djedda, *Botta*, *Herb. Paris.*

"The specimens from the Red Sea are smaller than that described by Velley, forming a kind of simple, foliaceous, flat expansion, at the centre of which grows a considerable number of lamellæ."—*Decaisne, Arch. du Mus.* ii. 116.

Genus 2. PHYLLODICTYON, n. g.

The frond oblong, free, lobed or confluent?, arising from a slender-branched articulated filament; the basal filament elongate, with opposite branches, each ending in a frond with a central rib, giving off close opposite branches at right angles to the main stem and each other.

This genus is described from a single specimen in the British Museum, collected by Mr. Menzies; it has evidently been torn by the waves on the edges, and is not in such a good state as one might wish. There are three, or rather the parts of three, oblong fronds, a smaller one from each side of the base of the larger, each of the three supported by a thin articulated filament, arising from an elongated stem an inch or so in length, with opposite branches.

As fixed on the paper with gum, the three fronds seem to coalesce at the edge, where they touch or overlap, but this may be only from the manner in which the specimen is mounted, and I fear that if it were attempted to be re-spread, the specimen might be injured, so we must wait until more specimens are obtained to settle the form of the edges of the frond and other particulars relating to it.

There can be no doubt that its habit is very different from that of the species of the genus *Microdictyon*, and that it is a beautiful *Alga*.

I can hardly understand how it has remained so long undescribed, but I cannot find any reference to it in any work within my reach.

1. *Phyllodictyon pulcherrimum.*

HAB. Gulf of Mexico, *Archibald Menzies, Esq.*, 1802, *Herb. Brit. Mus.*

The fronds are ten inches long and about three inches wide.

The *Cladophora (?) anastomosans*, Harvey, 'Phycologia Australica,' t. 101, is nearly allied to this genus. It must form a genus to which the name of *Pterodictyon* may be applied. It differs from *Phyllodictyon*, in which all the joints of the oblong frond are of nearly the same length, in the broad triangular shape of the frond, produced by the different length of the joints of the stipes and of the main branches. These joints gradually and regularly diminish in length as they approach the margin of the frond, "the former is stipitate, dichotomously bi-tripinnate, the pinnæ and pinnulæ opposite and horizontally patent, the alternate pinnules here and there anastomosing," and "arising from a wall of *irregular* branched filaments." Dr. Harvey believes the single specimen described and figured, which was cast ashore near Fremantle, Swan River, to be the young state of a species that is more netted in its adult age; the form of the frond and the length of the basal joint cannot be altered in the growth, and therefore *Pterodictyon anastomosans* must always be easily distinguished from *Phyllodictyon*.

Dr. Harvey mentions *Cladophora composita;* this is a section of the

genus, or a species, that has neither occurred to me in any work no herbarium.

Additional Notes on Anadyomene.

Since the printing of the first portion of this paper, Dr. Harvey has kindly sent me some notes on it, and some additional specimens for my collation and for examination.

His specimen of *Grayemma Menziesii* is much smaller than the one in the British Museum, and a considerable number of the filaments are formed of a single series of cells, but all these simple lines of single cells are continued for the length of several cells, without giving out any branches; they terminate in three or four equal cells, which are continued side by side according to what I consider the normal structure of the plant, or, after one or two such groups of cells, they split off again into long threads, formed of a single series of long linear cells, one on the end of the other. These varieties confirm me in the distinctness of the plant as a genus for the *Anadyomene*.

Dr. Harvey has also sent me some specimens of an *Anadyomene* from West Florida and from Bermuda, which certainly show that this species is variable in the size and form of the cells; and there is one specimen which seems in his opinion to combine the two species. He says the soft rigid state of the frond depends partly on the age of the specimen, partly on the length of time it is steeped in fresh water, and partly on the manner of drying. "The Key West plants, which are as common as *Ulva* are here, also differ greatly in the length of the joints of the generating filaments in different parts of the plant."

Amongst the specimens which Dr. Harvey has so kindly sent me is one named "*Anadyomene (?) Leclancheri*, Decaisne," from the Sooloo Archipelago. This plant shows that the characters which I have given to the tribe must be modified, and that the genera should be arranged into two groups, the *first* containing the genera I have described; they have the interspaces between the generating filaments filled up with smaller cells, making a continuous frond. The *second* has part of the interspaces between the filaments void, forming a netted frond, pierced with roundish holes or spaces between the meshes.

The *Algæ* of this group, though it has the netted frond, as in *Microdictyon*, cannot be confounded with that genus, as the mesh is formed of many different-sized and very variously-disposed cells, some

of them radiating from a centre, while in *Microdictyon* each side of the mesh is formed of a single conferva-like cell.

On this account I propose to call the genus *Cystodictyon.*

CYSTODICTYON.

The frond netted with rounded holes or spaces between the meshes, formed of elongate subcylindrical joints, giving out at certain distances a radiating fan-like series of cells, the interspaces between the longitudinal filament and the fan-like cells being filled up with unequal small cells.

Cystodictyon Leclancherii, t. f.—*Anadyomene (?) Leclancherii*, Decaisne.

HAB. Sooloo Archipelago, *Herb. Harvey and Gray.*

EXPLANATION OF PLATE XLIV.

Fig. 1. *Grayemma Menziesii*, nat. size; 2, magnified section of ditto; 3, magnified section of *Calomena Brownii;* 4, magnified section of *Anadyomene Cutleriæ;* 5, magnified section of *Anadyomene Wrightii;* 6, magnified section of *Cystodictyon Leclancherii.*

THIRSK BOTANICAL EXCHANGE CLUB.

(CURATOR'S REPORT FOR 1865.)

BY J. G. BAKER, ESQ., AND WILLIAM FOGGITT, ESQ.

As in previous years, we propose to give here a brief notice of the more interesting plants that have come before us during the past year, restricting such notice, as will be seen, to plants of which specimens have passed through our hands, notable either on the score of critical interest, or as having been found in tracts whence they are not registered in the 'Cybele Britannica' and its Supplement.

Thalictrum flexuosum, var. Through the kindness of Mr. William Richardson in sending a bundle of roots and living specimens of the *Thalictrum* of the exposed basaltic crags of Kyloe, near Belford, Northumberland, we are enabled to furnish the following description: —Stem 1 foot to 18 inches in height, green or purplish, leafy to the base, zigzag, hollow in the centre, not compressible, subterete, hardly striated towards the base, but marked in the upper part, especially below the sheaths, slightly glandular. Lower stipules with adpressed, upper with reflexed auricles. Leaves bipinnate; the leaflets pale green

above, glaucous and covered beneath with shining sessile glands, the terminal segment about ½ inch broad and deep, cuneate or rounded or even cordate at the base, three-parted at the apex, and sometimes the partings again toothed. Main petiole rounded, and marked with three striations on the back, channelled above, both the main and secondary petioles spreading from the axis at right angles. Panicle very diffuse, half the whole length of the stem or nearly so, the general outline broadly triangular, the lowest branch only furnished with a leafy bract about half its length; the branches patent or erecto-patent, arcuate, only 9 to 12 distant flowers upon the main branches. Anthers apiculate, 1 line long, pendent; the pedicel 2 lines long. Sepals narrowly ovate, 2 lines long. Carpels 2 lines long without the style, narrowly ovate, rather gibbous, irregularly 10-nerved, some of the nerves faint, and others deeper. From the ordinary north of England riverside form of the plant this differs principally by its hollow stem, smaller glandular glaucous leaflets, and few-flowered leafy panicle.

Viola permixta, Jordan. M. Jordan identifies the *Viola* gathered by Mr. Briggs, near Plymouth, and described in our report of last year as intermediate between *hirta* and *odorata*, with his own *V. permixta* (fasc. 7, p. 6, Boreau Fl. du Centre, 3rd edit. vol. ii. p. 74). He sends examples of this gathered in the neighbourhood of Lyons, and the comparison of our plant with these and an authenticated specimen sent by Professor Van Heurck, from Antwerp, leaves little room to doubt their substantial identity, though there are one or two trifling points of discrepancy in the published descriptions. Mr. Briggs took the trouble to send in spring several living examples of the Devonshire plant, and we give now a more complete description of it, side by side with one of the ordinary *V. odorata*.

V. permixta.	*V. odorata.*
Rootstock woody, scaly, wide-creeping, sending out stolons, which bear tufts of leaves and flowers, and occasionally take root.	Rootstock woody, scaly, wide-creeping, sending out long-rooting stolons, which bear tufts of leaves and flowers.
Petioles covered throughout with short stiff deflexed hairs at the flowering time, some of them 4 or 5 inches long, which is longer than the peduncles.	Petioles 1–2 inches long at the flowering time, some rather densely hairy with deflexed hairs, some nearly hairless, or the hairs so short as to be quite inconspicuous.
Leaves hairy all over on both sides,	Leaves rather less hairy on both

measuring at the flowering time about $1\frac{1}{2}$ inch long, including the lobes, by $1\frac{3}{4}$ broad, expanding in autumn to 4 inches by $2\frac{1}{2}$, so much cordate that there is only a narrow sinus left between the lobes, which are $\frac{1}{4}$ inch deep.

Stipules lanceolate, the ciliations few and very short.

Peduncles weak, slender, 2–4 inches long when the plant is in flower, the lower part hairy, the upper with only a few scattered hairs; the bracts linear and slightly gland-ciliated, placed usually below the middle of the peduncle.

Sepals oblong, blunt, faintly ciliated along the lower third of the edge; petals slaty-blue, the upper pair imbricated, $\frac{3}{8}$ inch wide, the lateral pair rather narrower, the lowest one $\frac{3}{8}$ inch across, distinctly emarginate at the apex, narrowed more gradually than in the other, and with fewer veins; the spur $\frac{3}{8}$ inch from its extremity to the tip of the lower petal; the anther-spur blunt, curved upwards, four to six times as long as broad.

Inodorous, or faintly scented.

sides than on the other, measuring at the flowering time from 1–$1\frac{1}{2}$ inch both ways, including the lobes, much larger in autumn, less pointed than in the other, and the lobes shorter (not more than $\frac{1}{8}$ inch long), and diverging more.

Stipules similar in shape, but the ciliations closer and more numerous.

Peduncles only about 2 inches long, not so hairy as in the other; bracts not gland-ciliated, placed generally above the middle of the peduncle.

Sepals oblong, blunt, sometimes the edge, sometimes the appendage only, faintly ciliated; petals white or deep purplish-blue, the upper pair $\frac{1}{4}$ inch across, and hardly if at all imbricated, the lateral pair about as broad, the lowest one $\frac{3}{8}$ inch across, distinctly emarginate at the apex; the spur keeled, and shorter and thicker than in the other; the anther-spur curved, blunt, three to four times as long as broad.

Odorous.

Viola lutea, var. *hamulata*. Having now raised from seed the Pansy from Marrick Moor, near Richmond, mentioned in Baker's 'North Yorkshire,' as a form under *lutea*, and grown it for three years without finding it lose its characteristics, we give a description of it here, to draw the attention of botanists to it as a possibly distinct variety or sub-species, bearing in some respects the same relation to typical *lutea* that *arvensis* has to *tricolor*. Rootstock thread-like, perennial, wide-creeping. Stems diffuse, much branched at the base, slender, quadrangular, pubescent below, but the pedicels naked. Lower leaves on naked channelled stalks about a $\frac{1}{4}$ of an inch long, roundish, with ciliated crenations about as broad as deep; upper ovate, bluntish, or even lanceolate, acute, with crenations two or three times as broad as deep. Stipules with the terminal lobe much larger than the others,

leafy and toothed. The lobes all ciliated, the lateral ones two or three on one side, usually one only on the other, linear or subspathulate, entire, erecto-patent or sometimes curved like a sickle. Bracts three-quarters of the distance up the pedicel, minute, ovate, acute, about the same width as the stalk. Sepals $\frac{3}{8}$ of an inch long, lanceolate, acuminate, slightly ciliated; the upper pair smaller, equalling the petals. Expanded corolla $\frac{5}{8}$ of an inch deep by $\frac{1}{2}$ inch across. Petals all yellow; upper pair pale, obovate, 2 lines across; lateral pair smaller, deeper-coloured, with each a tuft of hairs at the throat; the lowest one four lines across not marked at all, or marked at the throat with three to five faint lines. Spur slender, curved upwards, barely $1\frac{1}{2}$ times as long as the subquadrate, bluntly toothed calycine appendages. Anther spur linear-filiform, curved upwards, six to eight times as long as broad. The typical *V. lutea* has the terminal lobe of the stipules entire, and less leaf-like, the lower petal, when the plant is fairly developed, $\frac{1}{2}$ inch, the lateral pair $\frac{1}{4}$ to $\frac{3}{8}$ inch, and the upper pair $\frac{1}{2}$ inch across, so that the fully-expanded corolla measures about 1 inch each way, and the spur keeled and thickened at the end, about twice as long as the deeply-toothed calycine appendages.

Sagina ciliata. Sent by Mr. T. R. A. Briggs from Botus-fleming, Cornwall. New to the county, and Mr. Briggs has gathered it also in Devonshire.

Arenaria tenuifolia, var. *viscosa*, Bab. Under this name Mr. F. Townsend sends a plant from gravel-pits near Eriswell, Suffolk. It is not the true *A. viscosa* of Schreber, which has not yet been found in Britain, and is a much smaller plant than *A. tenuifolia*, with capsule shorter than the calyx, and petals half as long.

Agrimonia odorata. Sent by Rev. W. H. Purchas from Lydney, Gloucestershire. Detected last summer by the Rev. W. W. Newbould on hedgebanks near Thirsk, N.E. Yorkshire, and in woods near Staward Peel, Northumberland. It had previously been gathered in the latter county in two stations (Kyloe Crags, near Belford, and in Simonburn Dene, in North Tynedale), by Professor Oliver and Mr. W. H. Brown. This adds two provinces and one subprovince to its area as given by Mr. Watson.

Rosa tomentosa. Sent by Mr. Briggs from near Landulph, in Cornwall, and from another station in the north of the same county.

Rosa micrantha. Sent by Mr. Briggs from various stations near

Plymouth, some in Devonshire, and others across the Cornish boundary. A curious variety from near Bickleigh has globose fruit and naked peduncles.

Berberis vulgaris. Mr. Briggs sends a specimen, with which he writes—"It is from a Cornish station where I think it likely to be indigenous. It grows in two or three spots among bushes that fringe a low cliff or bank above St. John's Lake, an inlet from Hamoaze, and so connected with the sea."

Hybrids between Galium Mollugo *and* verum.

Mr. Briggs sends from the neighbourhood of Plymouth two forms of *Galium*, with which he writes, "The first, which I obtained on the edge of a cliff between Wembury and Bovisand on the 1st of July, is, I doubt not, the *G. verum*, var. *ochroleucum*, of 'English Botany,' 3rd edition. It is, I think, a hybrid. *G. verum* abounds on the cliffs where I found it, and *G. elatum* was growing near it. The other I think also a hybrid between the same two species, but partaking more of the characters of *elatum*. I found it on the 29th of June, growing on a bank by the side of the road between Plymouth and Saltash. There was only one root, close to which was a mass of *G. elatum* and a patch of *G. verum*." The characters of these two plants are as follows:—

G. vero-elatum.	*G. elato-verum.*
Stems about 1 foot long, slender, scarcely thickened at the nodes, pilose throughout.	Stems 1½–2 feet long, much stronger than in the other, conspicuously thickened at the nodes, pilose throughout.
Leaves about eight in a whorl, and fully deflexed upon the main stem, linear-subulate with revolute edges, the largest ⅝ inch long by not more than ½ line broad at the widest part, the texture thick, the midrib prominent beneath, the upper surface naked and bright green, the under surface paler and pilose principally on the midrib.	Leaves about eight in a whorl, deflexed upon the main stem, linear-obovate mucronate, broadest at two-thirds of the distance from the base to the apex, the largest ⅝ inch long by nearly 1 line broad, flat or the edges slightly revolute, the texture thinner than in the other, and the midrib less prominent, the upper surface dull green and naked, the lower grey-green, pilose principally on the midrib, the margin furnished with a row of short forward-pointing prickles.
Panicle compact, the lower branches erecto-patent and not more than from	Panicle composed of numerous distant long-stalked numerously-flowered

1–2 inches long, and the internodes still shorter; corolla segments a pale but decided yellow, ovate, bluntish, ½ line long by ¼ broad; the peduncles usually under 1 line in length, ultimately divaricate or deflexed; the fruit smooth, naked.

Leaves and flowers turning very slightly black in drying.

First fruit just full size July 1st, so that it will probably flower about the second week or middle of June, at least a fortnight earlier than the other.

clusters; corolla segments cream-coloured, slightly tinged with purple, quite as long as in the other, but rather narrower and sharper; the peduncles often exceeding a line in length, ultimately erecto-patent, or spreading at right angles, not deflexed; the fruit smooth, naked.

Scarcely turns at all black in drying.

First flowers opening June 29; styles united half the way down, sometimes longer than the stamens, sometimes shorter.

The flowers of both of these and of *G. verum* measure 1 line across when fully expanded, of *G. elatum* 1½ lines, of *G. erectum* 2 lines. For France, Grenier and Godron describe four forms intermediate between *verum* on the one hand, and *elatum* and *erectum* on the other, which they call *eminens*, *approximatum*, *decolorans*, and *ambiguum*; and for Germany, Dr. F. Schultz describes two, which he calls *Wirtgeni* and *Paulianum*. Of these *decolorans*, *eminens*, and *Wirtgeni* are nearest to *verum*, the other three to *Mollugo*. It would seem that we have here another instance of what has been observed to occur already with *Stachys palustris* and *sylvatica*, *Primula veris* and *vulgaris*, *Geum rivale* and *urbanum*, and perhaps also *Lychnis diurna* and *vespertina*, where pairs of closely-allied plants produce natural hybrids, in which sometimes the characters of one, and sometimes of the other parent, predominate.

Antirrhinum Orontium. Sent by the Rev. F. Addison from the neighbourhood of Braystones, in West Cumberland, where it has been noted recently in large quantities by Mrs. Pratten, daughter of the botanist Knapp. Anglesea is the most northern point, on the west side of the island, from which it is registered in the 'Cybele.'

Thymus Serpyllum and *Chamædrys.* After several years' cultivation side by side, the North Yorkshire forms of these two plants exhibit the following characters:—

T. Serpyllum.

Flowers 3 lines across when fully expanded, the lip 1½ lines deep; the upper segment oblong-emarginate and

T. Chamædrys.

Flowers 2 lines across when fully expanded, the lip barely 1 line deep; the upper segment roundish-emargi-

crenate, the lower one faintly marked in the throat.

Two under-teeth of calyx linear, $1\frac{1}{2}$ line long, exceeding the upper three, which are triangular in shape and narrowed suddenly to an apiculus.

Flowers mostly in a terminal head.

Leaves narrower and narrowed more gradually, the lower half fringed with hairs.

nate, the lower one distinctly marked on the throat.

Two under-teeth of calyx linear, 1 line long, the upper three not so broad at the base as in the other, and not so pointed.

Flowers usually with one or two separated whorls.

Leaves broader in proportion to their length, only the haft fringed.

A third form, from Falcon Clints, on the Durham side of the Tees, has the corolla and manner of growth of *T. Serpyllum*, with linear-lanceolate lower calyx-teeth, just equalling the upper ones; the leaves and lowest bracts obovate-spathulate, nearly twice as long as broad, including the haft, hairy not only all along the edges, but over the blade, and the stems densely hairy with rough hairs.

Stachys palustri-sylvatica, Schiede. Mr. Briggs sends from the border of a garden at Stoneybridge, Devonshire, and Mr. Bromwich from Beausale Common, in Warwickshire, examples of a not uncommon plant which comes about midway between typical *S. palustris* and the true *S. ambigua* of Smith. The leaves are narrower, less cordate, and less deeply-toothed than in this latter, and the stalks under $\frac{1}{2}$ inch long. These agree very well with an example marked *S. ambigua*, from Professor Boreau.

Rumex pratensis. Detected by the Rev. W. W. Newbould last summer in several stations ranging for altitude from 150 to upwards of 400 yards, in the dales of Durham and Northumberland (Teesdale, Weardale, and Allendale). This extends the north limit a province beyond what is stated in the 'Cybele,' and some of the localities come decidedly within the Superagrarian zone.

Surrey *Chenopodia*. Mr. Watson sends us this year, as he did last, a series of packets of Surrey *Chenopodia*, with which he writes: "The *Chenopodia* from Surrey are sent in continuation of a former series. The packets include various forms of *C. rubrum* and *C. urbicum* or *intermedium*. In the 'Flora of Surrey' a dwarf *Chenopodium* is given under the name of *C. botryoides;* but the specimens formerly distributed and supplemented by those now sent, suffice to show that the so-called *C. botryoides* of the Surrey Flora is really a state or variety of *C.*

rubrum, and not the true *C. botryoides* of the south-eastern coast. *C. urbicum* and its variety *intermedium* are both included by name in the 'Flora of Surrey.' The specimens now sent will show what forms were included under those two names. As no greater differences appear between these two forms than are found between varieties of *C. album* or of *C. rubrum*, it seems proper to look upon them also as one single species. Perhaps all of them would be assigned to *C. intermedium* only by Continental botanists, and if so, it may be held very doubtful whether the typical *C. urbicum* has ever really occurred in England. Branches from two or three large plants of *C. glaucum*, found in Guernsey, are introduced into some of the packets, because this is a very scarce species, and some mistakes and misnomers of it occur in works on British botany. The two dozen packets are numbered consecutively, but only about one-half of them contain a full series of the species and varieties."

Salix viridis? Mr. Watson sends a set of specimens in leaf thus labelled, with which he writes: "*Salix viridis?* is sent for distribution, in order to draw attention to the species of Fries, which has been stated to occur in different counties of England, on faith of specimens seen and named by Dr. Anderson, author of the 'Salices Lapponiæ.' Of course, it cannot be quite certain that Dr. Anderson would have likewise so named the examples now sent, but they do closely resemble some of the specimens from Surrey, which he named *S. viridis*."

S. viridis is stated by Fries* to be characterized by diandrous male flowers, "arrect" catkins with leafy stalks, concolorous deciduous scales, lanceolate-acuminate leaves, which are perfectly glabrous on both sides even when quite young and tough, erect branches. Fries seems to consider it as nearest to *S. fragilis*, but tending towards *triandra* in the habit of the catkins, and *alba* by the toughness of the branches; but a specimen from Mr. Watson gathered by Nyman, near Stockholm, has the young leaves decidedly silky, so that it would appear doubtful whether one of the characteristics mainly relied upon is absolute. In this example, the flowers of which are taken from the staminate plant when very young, the leaves in shape and texture resemble those of *fragilis*, the peduncles being densely silky, and the scales not not more than $\frac{1}{16}$ inch long, silky, narrowly obovate and

* 'Summa Vegetabilium,' p. 204.

bluntish. In *S. fragilis* the scales vary exceedingly in length and shape, and are sometimes nearly naked; in *S. alba* it is the same, and they are sometimes quite naked; in *S. triandra* they are always quite naked, more tenacious in texture, broader, and in shape bluntly spathulate.

S. undulata. Mr. Watson sends also a set of specimens in leaf from North Surrey, thus labelled on the authority of Dr. Anderson. This species is easily distinguishable from *S. triandra*, when in flower, by its shaggy scales, elongated style, and in the normal form by its silky capsule.

Hymenophyllum Wilsoni. Sent by Mr. W. Richardson from Harehope Moor, near Eglingham, on the Northumberland flank of the Cheviots. This is questioned as a plant of the Tyne province, in 'Cybele' supplement; but there are specimens in Winch's herbarium gathered on Simonside by Sir Walter Trevelyan, who has recently refound it on the same hill.

INTRODUCTIONS.—The principal plants which come under this head, which we have to notice this year, are the following:—

Alyssum calycinum. Field near Little Marlow, Bucks. J. Britten.

Neslia paniculata. On the beach at Sandown, Kent, August, 1865. Mrs. Benson.

Erysimum orientale. Mitcham, Surrey. H. Trimen.

Saponaria Vaccaria. Beach at Sandown, Kent. Mrs. Benson.

Arenaria montana. Wimbledon Common, Surrey; first noticed seven years ago by Mr. Pollock, of Wimbledon. W. Thistleton Dyer.

Trifolium agrarium, Linn. (*T. aureum*, Pollich.) Clover-field at Dounton, High Wycombe, Bucks. J. Britten. A weed in a barley-field at Hawnby, N.E. Yorks. (J. G. Baker), and seen several times by both of us in forage fields in the neighbourhood of Thirsk.

Vicia (Ervum) monanthos. Numerous specimens in a field of *V. sativa*, at Allenheads, Northumberland, 450 yards above sea-level, July and August, 1865. J. G. B.

Bupleurum protractum. Meadow near Gloucester. Dr. St. Brody.

Ammi majus. Bank of the Severn, near Gloucester. Dr. St. Brody. (See Journ. of Bot. 1865, p. 26.)

Artemisia scoparia, with *Hibiscus Trionum*, *Malva crispa*, and other mostly mid-European species, in great abundance in London on the site of the Exhibition of 1862.

Aster leucanthemus, Desf. One root from 1860 to 1865, near Thimble-bridge, Thames Ditton, Surrey, where it will likely be soon lost by building changes. H. C. Watson.

Phyteuma spicatum. A single root of the blue-flowered variety, on a railway embankment near Hill Wootton, Warwick. H. Bromwich.

Echinospermum Lappula. In the same station as the *Neslia* and *Saponaria Vaccaria* mentioned above.

Plantago arenaria. Southend, Essex; a few plants on the beach east of the gasworks. J. T. Boswell Syme.

Amaranthus retroflexus. Waste ground near Gloucester. Dr. St. Brody.

Thirsk, January 24, 1866.

ON *PAPAYA VULGARIS*, *De Cand.*

BY A. ERNST, ESQ.

In a letter dated October 14th, 1865, Dr. B. Seemann drew my attention to the æstivation of the male flowers of *Papaya vulgaris*, asking whether it was always dextrorsal and sinistrorsal in the same raceme, as he had found it in his Vitian specimens. It was only within the last few days that I had material enough for answering this question satisfactorily. I examined 875 flowers, 626 of which (or 71·5 per cent.) had a dextrorsal, 249 (or 28·5 per cent.) a sinistrorsal æstivation, both forms really occurring in the same raceme.

At the same time I made some other observations on this imperfectly-known plant, which I may here briefly state.

Papaya has three different kinds of flowers,—staminiferous, pistilliferous, and hermaphrodite. The latter two are found on the same tree, whereas the stamen-bearing flowers grow exclusively on distinct individuals, which in this country is called "*Lechoso macho*" (*i. e.* male).

Alph. de Candolle's description of the *male* flowers of *Papayaceæ* (Prod. 15. ii. 412) agrees very well with our species. Nevertheless there are two additions to be made. The difference of æstivation is already mentioned. In all the male flowers I examined, the anthers had no appendix at all, but a very small mucro, which marks the upper end of the longitudinal slit by which the anther opens. The

back part of the stamen is covered with whitish down. Nearly all the stamen-bearing flowers have a rudimentary pistil, " e basi ovoideâ longe subulatum." (A. De Cand. l. c.; conf. also Journal of Botany, iii. 310.)

The *pistilliferous* flowers appear to be little known, as Alph. De Candolle complains of having found none in the different herbaria,* and I beg leave to give the following description:—

Petala 5, a basi libera, calyci alterna, lanceolato-linearia, erecta (4–5 c.m. longa, 10–15 m.m. lata) æstivatione dextrorsum contorta (in flore adulto apice bis terve spiraliter contorta); staminum rudimenta nulla; ovarium ovoideum, leviter et obtuse pentagonum; stylus minimus; stigmata 5, irregulariter lobata, ambitu contorto, intus et margine exteriori (limbi instar) papillosa, caduca; ovula ∞, 5-seriata, anatropa.

The *hermaphrodite* flowers, which produce fruit like the female flowers, have been altogether overlooked; at least I could not find any notice of them in the books at my disposal. I found them on *all* the female trees I examined, though never in any great number. I add the following description:—

Calyx ut in fœmina; corolla gamopetala, tubo ovoideo, calycino, obtuse quinque-angulato, pariete crassa, lobis 5, dextrorsum contortis, erectis; stamina ut in mare, fauci corollæ inserta; ovarium semi-superum, parte inferiori inclusa, non adnata; ovula ∞, in juvenili floris statu pariete externa inordinatim acervata, in flore adulto 5-seriata; stylus minimus (aut, si mavis, nullus); stigmata 5, inæqualia, indivisa, papillosa.

The stem of *Papaya* is generally simple; but sometimes it becomes branched when getting old, and then it does no longer produce fruit. The pith disappears very soon, and the hollow parts fill up with a watery fluid, which even in the hot season does not evaporate. The tree thus acts as a kind of natural drainage, a fact well known to the people of this country, and it is planted, not so much for the fruit, which is no favourite here, as for its water-absorbing power.†

* I have preserved a considerable number of female and hermaphrodite flowers in alcohol, which I shall forward for distribution to the Editor of this Journal.

† The seeds of *Papaya* have a very pungent, aromatic taste, which resembles most that of *Tropæolum majus*, L. They are used on account of their anthelmintic properties. The milky sap of the fruit has the well-known effect of rendering the toughest meat tender. By making slight incisions in the *unripe*

About Carácas, I have as yet met with the following three *Papayaceæ* only, viz. *Papaya vulgaris*, De Cand.; *Vasconcellea cauliflora*, De Cand. (conf. Journ. of Bot. iii. 310); and *Vasconcellea microcarpa*, De Cand. Of the last species I have seen the fruit only, which is truly 5-celled; whilst the shape of the fruit and the seeds are exactly as described in the 'Prodromus.'

Carácas, Venezuela, January 1, 1866.

A NEW FIJIAN HEDYCARIA.

By Prof. Asa Gray.

1. *Hedycaria dorstenioides*, sp. nov.; foliis fere membranaceis ovatis oblongisve plerumque integerrimis longius petiolatis; racemis terminalibus 5–7-floris; receptaculo cum perigonio peltato-disciformi margine subintegerrimo, masculo glabro supra antheris in numeris dense vestito, connectivi apice dilatato truncato quam loculi angusti latiore; fructifero supra pubescente; drupis haud stipitatis.

Var. *β. denticulata;* foliis membranaceis rariter dentatis vel denticulatis.

Hab. Sandal-wood Bay, Fiji Islands; with broadly ovate, also Vanua Levu, with oblong leaves, all entire. Samoan Islands; mostly with larger and thinner, ovate-oblong leaves, sometimes toothed (var. *β*.)

The peculiarity of the species is in the flat, disk-shaped, *Dorstenia*-like male (and I suppose also female) receptacle, the lobes or calycine part of which is reduced to obscure crenatures, and in the truncate-dilated tip of the connective of the anther, resembling that of most *Anonaceæ*.

I have from the Fiji Islands imperfect specimens of what I take may be a new genus of *Monimiaceæ-Atherospermeæ*, with *alternate* entire

fruit, the milk runs forth abundantly; it is then of a bluish-white colour, and of a very strong smell. It congeals almost instantly, forming a kind of transparent gelatine, which has no smell, but an acrid, burning taste. This substance is soluble in alcohol. Mr. Feustell, of this town, is engaged in making a careful chemical analysis of the milk. The vernacular name, "*Lechoso*" (*i. e.* containing milk), is of a comparatively recent date; Gumila, Caulin, and all the writers of the last century call the tree *Papaya*.

leaves, and a sort of lignescent receptacle, bearing achenioid ovaries, very hairy, and a perianth of 4 or 6 broad lobes; but we can make nothing of it, unless Dr. Seemann should have some materials.

REMARKS ON THE MODERN TENDENCY TO COMBINE SPECIES.

By H. F. Hance, Ph.D., etc.

The extreme tendency shown by some of the most illustrious and experienced of modern botanists to combine closely-allied species, is no doubt to be regarded as a practical protest against the views of such writers as MM. Boreau, Jordan, Schott, and, to some extent, Boissier. But as is usual in such cases, the reaction has been as excessive as the evil which called it into existence; and, as I have elsewhere had occasion to remark, in many instances the reductions are evidently proposed on purely abstract grounds, or mere theoretical notions as to the possible extent of variation, and not from direct observation; in other words, a given plant is assumed to be a form of some allied species, because, in the writer's judgment, that species *ought* to vary within certain limits. It is not difficult to adduce direct proof of such being the case. The Australian continent, from climate and physical configuration, appears pre-eminently to favour variation. After years' close study of the vegetation of that vast territory, influenced doubtless by daily accumulating examples of the protean forms assumed by common and well-known plants, the excellent and laborious Dr. F. Mueller, in his 'Plants Indigenous to Victoria,' combined various species of *Boronia*, *Dodonæa*, and *Tribulus*. Mr. Bentham, re-examining the species of these genera in his 'Flora Australiensis,' with the same materials used by Dr. Mueller, not only in many instances is at issue with that author, but even in some cases considers the reduced species more nearly to others than those to which they had been referred. At page 18 of the above work, Dr. Mueller unites without hesitation *Hibbertia angustifolia* and *H. fasciculata*; Mr. Bentham, after careful revision of the whole genus, not only keeps them apart, but places them in different subsections. Dr. J. D. Hooker, in his paper on the distribution of Arctic plants, reduces the American *Viola blanda*, Willd., to *V. palustris*, L., on which Professor Asa Gray observes (Am.

Journ. Sc. and Arts, xxxiii. 404), "Dr. Hooker goes a step too far in referring our *V. blanda* (with its lanceolate sepals and white flowers) to *V. palustris*." Again, in reference to Dr. Hooker's combination of *Archangelica Gmelini*, De Cand., and *A. atropurpurea*, Hoffm., Professor Gray writes, "I have no question (theories of derivation apart), that these plants are abundantly distinct, as well in their fruit as in their whole appearance." I will cite only one other example, the eccentric combinations of *Campanulæ* proposed by Vucotinovic. The differences between advocates of this system are in themselves not uninstructive. In all the above instances, it seems to me manifest that theoretical views have alone determined the reductions; and if this be admitted, it is difficult to deny that such a practice must be directly detrimental to science. In the many cases where the limits and complex relations of species are puzzling, what is wanted is an Œdipus, not an Alexander: we have to decipher the enigmas of nature, not to settle them by an authoritative cutting of the knot. A theoretical decision, since it is not based on actual observation, is, indeed, strictly speaking, an evasion, not a solution of the difficulty. Between the opposite views above referred to, I believe the prudent and cautious student will do well to steer a *juste milieu* course; in botany, no less than in the ordinary affairs of life, "Ne quid nimis" is a useful and reliable maxim.

The following excellent remarks of Fries seem to me deserving of all attention, especially from young botanists:—"Minus noxiam censemus levitatem, qua novæ species hinc inde proponuntur, quam temeritatem, qua magnæ cæterum auctoritatis viri, obiter inspecto uno alterove specimine sicco, dubia movent de plantis cuique in natura perito botanico distinctissimis. . . . Si enim consentiant in cardine, quæ *in natura confluant aut constanter differant*, levioris utique est momenti, utrum singulas distinguamus, an plures affines, quas cæterum constantes agnoscimus, sub communi titulo comprehendamus e theoria easdem ob affinitatem ex eodem typo primario natas, quam rem nulla experientia vel probare vel refutare valet, cum involvat petitionem." (Novit. Fl. Suec. Mant. iii. p. 8.) Here the particular evil of the modern tendency is well pointed out. Instead of attention being *directed* to critical and very possibly distinct forms, the practice of massing them together, *undistinguished even as varieties*, absolutely *diverts* attention from them, and thus impedes a careful and comparative study. If ultra-synthetic botanists were thoroughly logical, they

would probably have to combine very many universally-recognized species, as has indeed been done, *franchement et hardiment*, by Mr. Bentham in his 'Handbook of the British Flora.' Take, for example, two such closely-allied plants as *Bupleurum rotundifolium*, L., and *B. protractum*, Hffmg. and Lk.; these absolutely differ only by the greater or less number of umbel-rays, and by the smooth or tuberculate fruit. Now, a depauperate inflorescence is certainly no very strong character, and the fruits of *Umbellifers* are in several instances (*e. g.* typical *Cachrys pterochlæna*, De Cand., et ejusdem var. *leiocarpa*, Cosson), variable as to surface. The examination of two such plants as those I have just alluded to will make any reflecting person ponder over Mr. Darwin's most acute query as to what is meant by affinity, if not community of descent; and the concluding sentence quoted from Fries will show that, though willing enough to assent (by anticipation) to this hypothesis, he has stated the objection which will always be urged against it by adversaries, that it is incapable of proof; that is to say, from an *hypothesis* it can, by its nature, never become a recognized *fact* in science. Now, hypotheses involving unfamiliar assumptions, or which are *primâ facie* very startling, are perhaps for the most part welcomed or rejected rather according to the particular bias of each particular thinker's mind than from other considerations.

In making the foregoing remarks, it is scarcely necessary for me to disclaim any disrespect towards the eminent authors whose opinions I dissent from. I do not, of course, pretend to possess a tithe of their learning, experience, or varied opportunities for study. But as in politics and religion, so in scientific questions, we find the most single-minded desire to seek truth, the acutest mental powers, and the ripest experience, consistent with the most widely-divergent views; and many years' unremitting devotion to botanical studies gives me, I hope, a claim to state my own conclusions.

Whampoa, S. China, 10*th October*, 1865.

NOTE ON THE GENERA CUPHEANTHUS AND PUNICA.

In my 'Flora of the Viti Islands,' p. 76 in adnot., I described a genus from New Caledonia, which towards the end of last century had been discovered by Anderson, but never before been made known.

The genus is an anomalous one, and as its long tubular curved calyx reminded me of *Cuphea*, I named it *Cupheanthus*. At first I decided to place it in *Lythrarieæ*, and had actually the letterpress set up in that way, but finally determined to retain it in *Myrtaceæ*, chiefly on account of its inferior ovary, and certain features which it has in common with *Punica*, such as the thick valvate and coloured calyx, and the impunctate subverticillate leaves. I now find that Bentham and Hooker ('Genera Plantarum,' p. 696), whilst retaining *Cupheanthus* amongst the anomalous genera of *Myrtaceæ*, refer *Punica* to *Lythrarieæ*. In my mind there is no doubt that *Punica* and *Cupheanthus* are closely allied, and must be dealt with collectively; and it is singular that we should have arrived independently at the same conclusion about their affinity. Unfortunately, the only specimen of *Cupheanthus* existing at the British Museum, is imperfect, but I think there is no doubt that the calyx is valvate; I have never seen any calyx of the thickness of that of *Cupheanthus* that is imbricate, as the authors of the 'Genera Plantarum' suppose it to be. Recent investigations have almost completely broken down the boundary-line between *Myrtaceæ* and *Lythrarieæ* upon which systematists formerly used to rely. I am therefore rather curious to see what absolute characters Bentham and Hooker have been able to find to distinguish them, or whether their labours—which nobody appreciates more than I do—tend to show that the two supposed Orders should be merged into one.—B. SEEMANN.

CORRESPONDENCE.

White-flowered Varieties of British Plants.

High Wycombe, January 5, 1866.

Geranium phæum, L.; *Antirrhinum Orontium*, L.; *Armeria maritima*, L.; *Daphne Mezereum*, L.; and *Scilla autumnalis*, L., may be added to my previous list, and these, with those given by Mr. Gissing (Vol. III. p. 383) will raise the number of species in which such variation occurs to 171; viz. 92 having blossoms in which some shade of *red* normally predominates, 58 in which some shade of *blue* normally predominates, and 22 in which some shade of *yellow* normally predominates.

Yours, etc.,
JAMES BRITTEN.

Leucojum vernum *a probable British Plant.*

118, Embden Street, Hulme, Manchester, February 5, 1866.

Last autumn an acquaintance of ours brought, from near Bridport, Dorset, a number of bulbs of a plant well known to the rustics of that pastoral neighbourhood by the name of "Butter and Eggs;" the locality was described as an old neglected hedgerow, overrun with brambles, etc., and it was further stated, that for generations back the plant had been known as a favourite wild-flower on account of its beauty, sweetness, and appearance in the early spring.

The bulbs were planted in a belt of wood, and the plant turns out to be *Leucojum vernum*, which is described as occurring in similar situations in Germany, etc., and I make this communication with the view of directing the attention of botanists who may happen to visit the neighbourhood to it, in order that the locality may be further examined.

Yours, etc., J. HARDY.

Bougainvillea spectabilis *in New South Wales.*

Sydney, New South Wales, December 19, 1865.

The *Bougainvillea*, an ornamental and showy evergreen climber, a native of the lowlands of Peru and Bolivia, is now naturalized in New South Wales, where it attains great perfection. It may be seen in full bloom during the months of September, October, and November, displaying a mass of rich and brilliant rose-colour, or rather a hue closely resembling the new and delicate colour called mauve; this beauty of colour is imparted by the floral bracts, among which, on examination, the small, insignificant flowers are found. This elegant shrub continues full two months in bloom. I saw a magnificent specimen at the end of October in full bloom at the rear of the residence of William Byrnes, Esq., at Paramatta, forming a gorgeous show, the tree being enveloped in a "perfect blaze of flowers," extending by measurement to the length of 47×12 feet, forming 564 superficial feet. The trunk at the base measured a diameter of 8 inches, and the tree is now said to be sixteen years old. I was informed that when first planted by Mrs. Byrnes, it was trained in an eastern aspect; in that situation it grew luxuriantly, but never flowered. The branches were then cut down to a certain extent, and trained in its present position, a northern aspect, the result of which was, that it soon commenced to blossom, and has continued to produce flowers annually in great profusion ever since. The *Bougainvillea* is readily propagated by cuttings, and is also considered a most useful plant to cut for indoor decorations, retaining its brilliant colour for a long time. It is not uncommon to see in and about Sydney this plant, the *Bignonia venusta*, with its elegant festoons of orange-coloured blossoms, and the *Wistaria Sinensis*, with a profusion of pendulous clusters of delicate blue flowers, all in bloom at the same time, imparting their rich and bright colours upon the walls and verandahs of the houses, or trailing over the trellis in the gardens. Yours, etc.,

GEORGE BENNETT, M.D.

Explosion of Pods with an audible Report.

Sydney, N. S. Wales, December 18, 1865.

Some time since, I received some pods of a leguminous plant, found in abundance about the Mackenzie River, Rockhampton, Queensland, known by the popular name of the "Mackenzie or Rockhampton Bean," and which has been found as good a vegetable as the "Scarlet-runner." It is found growing abundantly on the sandy banks of the creeks, as well as in the scrubs on the summit of the Granite ranges. I placed the ripe pods on the chimney-piece, and one evening, just after a fire had been lighted, I was startled by a loud noise, exactly as if one of the glass shades had been suddenly cracked; on examination I found the noise was occasioned by the explosion of the pods, and seeds being scattered with great force over the room. No doubt the warmth of the fire condensed the air contained in the pods, and caused the explosion.

Yours, etc.,

GEORGE BENNETT, M.D.

NEW PUBLICATIONS.

The Every-day Book of Natural History, comprising a Note for every day on the Flowers, Insects, Birds, Animals, etc., most commonly observed on rambles into the country throughout the year. By James Cundall. With illustrations. London: F. Warne and Co. 1866.

This is a reprint of short notes on natural history subjects which first appeared in the 'Western Daily Press,' and have undergone some revision. The idea of supplying a popular botanical or zoological article for every day of the year is a happy one, and we regret that J. C., as the author calls himself on the title page, and James Cundall as he signs himself at the end of the preface, did not turn it to better account than furnish slight and short compilations, in which he generally manages to miss the very points which a popular writer should have endeavoured to bring out. He opens his book with the Daisy. Now, an explanation of its name ("Day's-eye") would have furnished a capital peg for hanging some interesting facts upon about the closing in of the ray-florets when the sky is becoming overcast or evening approaches. He might have launched out into the motion of plants, or pointed out the singular difference between our Daisy and the Australian, the ray-florets of which, like those of many other *Compositæ* of the southern hemisphere, turn backwards when not under the full influence of the sun. In a popular book an interesting story might have been told in connection with Groundsel, sold in our Lon-

don streets by beggars of the most abject description, and about the trade of which some statistics are available. If the book was worth a longer notice in a Journal like ours, we might go right through its pages, offering hints and suggestions; but we must pause, hoping that the author, before he comes again before the public, will more profitably cultivate a field for which he evidently has a fancy.

A Monograph of the British Cladoniæ. By W. Mudd. 1 vol. quarto, 36 pp., with fasciculus of dried specimens of 80 species and varieties.

What *Rubus* is to the student of British flowering plants, *Cladonia* is to the lichenist, with the added intricacy which results from the different appearances assumed by the same plant in different stages of growth. As our author writes, "The genus is well defined, and its limits easily determined, (he includes under the name, it should be observed, like most modern writers, *Scyphophorus* and *Pycnothelia* of the British flora,) but by far the greater portion of its species are doubtful and unsatisfactory. They have such a strong tendency to break up into endless varieties or forms, that the student is often puzzled to know which are to be regarded as types of species and which as degenerations. Such genera furnish a fitting task for the monographers. General botanists have usually their hands too full to unravel their intricacies; and as it has been with most other genera of this kind, so it has been with *Cladonia*. There has been an extremely wide divergence in regard to the limitation of the book-species. Some, like Scopoli and Hudson, have cut the Gordian knot by referring all the varied forms of Cup-mosses to a single species. Both here and in his Manual, Mr. Mudd has steered a middle course between the opposite extremes. For Britain, exclusive of the ambiguous *Cladonia vermicularis* of Swartz, he recognizes and describes fourteen specific types, viz.:—1. *endiviæfolia*; 2. *cervicornis*; 3. *coralloidea*; 4. *cariosa*; 5. *pyxidata*; 6. *gracilis*; 7. *degenerans*; 8. *squamosa*; 9. *furcata*; 10. *rangiferina*; 11. *stellata*; 12. *amaurocræa*; 13. *coccifera*; 14. *Papillaria*; and under these he groups 143 described varieties, or, as most of them would perhaps better be designated, states of development. The example of illustrating the genus by special fasciculi of specimens, has been set upon the Continent by the Abbé Coemans and Professor Anzi, who have lately issued beautifully-prepared sets of the

Belgian and Italian forms. Mr. Mudd has followed this method, and subjoins to his paper very full and satisfactory examples of all his species, and upwards of eighty of his forms, so that altogether his work possesses that commendable thoroughness which, when a monograph lacks, it stands without excuse.

The only fault which we have to find is on the score of nomenclature. It seems to us that the lichenists are causing themselves considerable needless confusion by not following the received rules with regard to the adoption of names and citation of authorities for them. Schœrer is the principal offender in this respect. To cast aside the widely-accepted Linnæan name of *uncialis*, and re-christen the plant *stellata*, as Schœrer has done, and Kœrber, Rabenhorst, and Mr. Mudd have followed him in doing, is quite contrary to rule. Mr. Mudd's "*Cladonia endiviæfolia*, Ach.," is just Hudson's *Lichen foliaceus* (1778). The name *endiviæfolius* goes back as far as Vaillant and Micheli, but in post-Linnæan times Dickson was the first to apply it, whilst *alpestris* and *sylvatica*, for which Mr. Mudd cites Hoffman and Acharius, both go back to Linnæus.

About the spermogones of *Cladonia vermicularis*, a doubtful plant altogether, the lichenists are widely at issue. What Dr. Nylander considers as the spermogones of the *Cladonia*, Mr. Mudd refers to a new parasitic *Endocarpon*, which he describes here under the name of *E. Crombii;* and what Dr. Lindsay considers as such he credits to a *Lecidea*. As the readers of the Journal will already be prepared to understand from what Mr. Carroll has told them, since the publication of the Manual in 1861, a large number of Lichens new to Britain have been detected, and Mr. Mudd intimates that a revised edition of that work is in preparation.

Notes sur quelques Plantes rares ou critiques de la Belgique. Cinquième fascicule. By Professor Crépin. Brussels : Gustave Mayolez. 1865. 8vo, 274 pp. with 6 plates.

The establishment of the Royal Society of Botany in Belgium has given a great impulse to the study of its indigenous vegetation, and Professor Crépin has in this, the fifth part of his notes, to register the discovery of fourteen novelties, in addition to eight species now clearly established as Belgian plants, which before were classed amongst the "doubtfuls." These twenty-four species are the following, viz. :

Adonis flammea, *Adonis autumnalis*, *Neslia paniculata*, *Colutea arborescens*, *Vicia villosa*, *Asperula glauca*, *Crepis pulchra*, *Verbascum pulverulentum*, *Rumex aquaticus*, *Rumex maximus*, *Stellera Passerina*, *Taxus baccata*, *Orchis palustris*, *Potamogeton mucronatus*, *Corallorhiza innata*, *Carex dioica*, *Carex paradoxa*, *Carex ornithopoda*, *Carex depauperata*, *Glyceria Borreri*, *Aspidium Lonchitis*, *Chara Braunii*.

All these are fully characterized, the critical species being described and compared with their allies with great care and minuteness; and in addition to this nearly seventy other species are enumerated, which are rare in Belgium, on the local distribution of which the excursions of 1865 have thrown new light. Considering the feebleness of the boreal or alpine element in the Belgian flora, we may consider *Aspidium Lonchitis* and *Corallorhiza* the most interesting of the additions. They have both been met with in the Ardennes, where they are associated with *Lycopodium alpinum* and *Allosorus crispus*. Of the former only a single tuft has been gathered, at an elevation, if we understand M. Crépin correctly, of 250 metres above sea-level. *Potamogeton mucronatus* is our *compressus*. *Chara Braunii* (*C. coronata*, A. Braun) is known in every continent except Australia, and in Western Europe is diffused from Finland southward to Spain and Corsica, so that it may reasonably be expected in Britain. It is characterized by stem and rays formed of simple tubes and upper articulations terminated by numerous points. In a supplementary paper on the European *Glyceriæ*, M. Crépin proposes two new species, both from the shores of the Mediterranean, which he names *expansa* and *pseudo-distans*. The six plates are entirely devoted to the illustration of this genus. Our *G. Borreri* M. Crépin has found in Belgium abundantly, not only on the seashore, but also in sandy ground inland, and recognizes as a fully distinct species.

BOTANICAL NEWS.

Mr. Hemsley, of Kew, is now collecting materials for a flora of his native county, Sussex, and would feel thankful to resident botanists for complete local lists and specimens of critical plants. Communications should be addressed to him at Kew, W.; and as a certain number of subscribers will be necessary before any final arrangement can be made for publication, we trust our British botanists will not fail to encourage him by sending in their names.

A petition is now in course of being signed by botanists to urge upon Go-

vernment the desirability of purchasing the herbarium and part of the library of the late Sir W. Hooker, for £6000.

The Stockholm Academy is going to publish a photo-lithographic reprint of the first edition of Linnæus's 'Systema Naturæ.'

The Austrian Government has bought the *Aroideæ* and alpine collection of Schott's herbarium, and the Horticultural Society of London the library of the late Dr. Lindley.

The series of scientific lectures which Drs. Huxley and Carpenter and Sir John Bowring have commenced, at St. Martin's Hall, on Sunday evenings have been discontinued, as doubts have been raised whether they were not a desecration of the Sabbath, and funds are now collecting for a lawsuit to see whether Sunday scientific lectures are or are not an infringement of the law.

The Jamaica papers of December 6, 1865, remark on the subject of Chinchona cultivation :—"The alleged difficulty of raising these valuable plants in Jamaica, difficulties which were regarded with superstitious awe, insomuch that even our Prime Minister shared in the delusion, has now been practically solved. One tree, a magnificent specimen at Clifton, is now in bloom. The tree is 11 feet in height. It will be recollected that the late lamented Dr. Daniell extracted some highly valuable alkaloids from the leaves of the plants at Clifton. (Conf. Journ. of Bot. ii. p. 100.) We trust that Mr. Nathaniel Wilson will receive some mark of appreciation from the country for his perseverance in the cultivation of these valuable plants, notwithstanding obstacles and 'good and evil report.'"

Messrs. J. J. Bennett, Miers, Babington, and Daubeny have been elected vice-presidents of the International Botanical Congress.

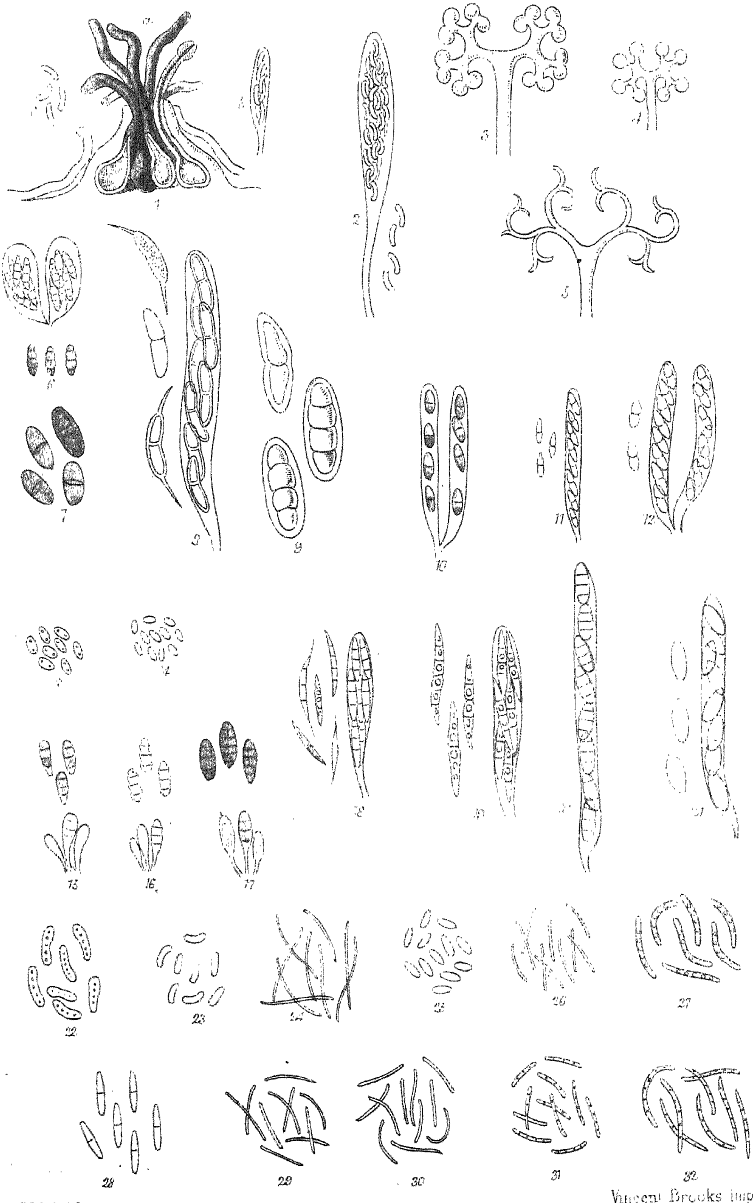
On the 27th of January, died, at Gratz, in his sixty-ninth year, Dr. Joseph Maly, author of a 'Flora von Deutschland,' 'Botanik für Damen,' and several other works. He was a native of Prague, but resided the greater part of his life at Gratz, where he practised as homœopathist until, about fifteen years ago, he became totally deaf. In his private character he was a very estimable man, unwearied in his attention to any botanist who came with an introduction to him, and most liberal in imparting information; but not a man of enlarged views, or philosophic turn of mind. In the discrimination of species he was most accurate, and his books are therefore of great value as a guide to the flora of his country. By the loss of his practice, which was never a very lucrative one, he was reduced to poverty, and, notwithstanding the generous assistance of his fellow-townsmen and friends, seems to have passed the last years of his life in want of many comforts that in better days he had been used to regard as necessaries.

Our obituary of this month must also include the names of Dr. Peter J. Lenné, Director General of the Royal Gardens at Potsdam, near Berlin, who was born at Bonn in 1789, and died on the 23rd of January, and whose name survives in the Leguminous genus *Lennea;* also that of George Schnittspahn, Director of the Botanic Garden at Darmstadt, who was born on the 3rd of January, 1810, and died ont he 22nd of December, 1865, and who was the author of a monograph of *Sempervivum*, of which he cultivated probably one of the largest collections in Europe, and many pomological articles.

BOTANICAL SOCIETY OF EDINBURGH.—December 14. Professor Balfour in the chair.—The following communications were read: —I. Observations on the Genus *Moringa*. By N. A. Dalzell, M.A., Bombay. The author called attention to the affinity between *Moringa* and the *Bignoniaceæ*. In both there is a long pendulous capsule, with winged seeds seated in cavities of a spongy or corky placenta; the seeds of both are exalbuminous and parietal, with the radicle next the hilum. Although the seeds of *Bignoniaceæ* are generally transverse, yet *Moringa* agrees with the tribe *Incarvilleæ* in having the seeds pendulous, while in the amygdaloidal character of the cotyledons, *Moringa* resembles *Oxycladus* and *Crescentia*. In habit, foliage, and inflorescence there is a striking resemblance between *Moringa* and *Bignoniaceæ*, as may be well seen in *Bignonia moringæfolia*, *B. xylocarpa*, and *Millingtonia hortensis*. The author considers *Moringa* as essentially gamopetalous, and thinks that there is no true disk; what has been called a disk appears to be the coherent bases of ten filaments. He concludes that *Moringa* belongs to the *Bignonial* alliance. II. On *Asplenium Petrarchæ*, De Cand., as an Irish Plant. By F. Naylor, Esq. A specimen of only one plant was observed near Flurry Bridge in Ireland, and since its discovery the station has been robbed. From the single frond which was shown, it was not easy to come to a definite conclusion as to the species. Mr. Newman, however, has noticed the Irish plant as *Asplenium Petrarchæ*, in the fourth edition of his 'British Ferns.' III. On the Cyclone of 5th October, 1864, at the Botanic Garden, Calcutta. By Dr. Thomas Anderson. (Already published in 'Journal of Botany,' Vol. III. p. 370.) IV. Notice of Plants collected in Iceland, etc. By M. Éd. Jardin, Cherbourg. M. Jardin's paper was accompanied by a set of specimens of plants collected by him in Iceland, Faroe Islands, and Norway. Some of them were found in very hot springs and in the vicinity of the Geysers. Among them were an *Equisetum*, a *Juncus*, a *Conferva*, a *Potamogeton*, a *Chara*, a *Hippuris*, and a *Hypnum*. V. Letter from Mr. William Milne, dated Cameroons, Africa, 27th June, 1865. Mr. Milne alludes to the improvement which has taken place in Fernando Po and its vicinity by the clearing of the ground and the planting of chocolate-trees and cotton. By the end of this year one firm will have upwards of 100,000 cacao-trees above ground, and these plants will produce in 1867 about 500,000 pounds of cacao. During the early stage of the plantation, cotton is planted among the chocolate-trees. Coffee has also been extensively planted, and thrives well. Mr. Milne alludes to the bark of a tree called Saricu, more rapidly fatal in its effects than the Calabar bean, and used as an ordeal poison. He alludes to the introduction of the mango, breadfruit, soursop, citron, tamarind, and other important plants into Calabar and the Gaboon. Mr. Milne then gives an account of an excursion to the Cameroon Mountains, and notices some of the plants collected. Dr. Greville noticed the occurrence of a rare fungus (*Sparassis crispa*) at Didlington Park, Norfolk, the seat of A. T. Amhurst, Esq., and showed a drawing of the plant of the natural size made by Admiral Mitford of Hunmanby, Yorkshire. It is of a cream-white colour, and as large as a full-grown cabbage. Professor Balfour exhibited specimens of Plantago collected on the mountains of Scotland, which seemed to correspond with *Plantago alpina* of the Continent. [But from specimens kindly sent to me for examination it is merely a form of *P. maritima*.—ED.]

January 11th. Dr. Greville, President, in the chair.—The following communications were read:—I. Notes on Orchella Weed and on a new Sphæria from Angola, West Africa. By Dr. L. Lindsay. The author stated that he had found attached to specimens of Angola Orchella-weed fragments of the trees and shrubs on which the weed, a species of *Roccella*, grows. These twigs were not such as to enable him to determine the species on which they grow. He remarked that it was of importance that we should know the species of trees which nourished the valuable *Roccella* (*R. Montagnei* and *R. fuciformis*), which constitutes the Orchella of commerce, imported largely from the coasts of Central Africa. These *Roccellæ*, which appear to have completely superseded all other lichens in the manufacture of orchil and cudbear, are as common in the eastern as in the western coasts of Africa. Dr. Kirk has sent specimens of a state of *Roccella fuciformis*, growing on *Dalbergia Melanoxylon* on the Roruma river, in eastern tropical Africa. On the same twigs affected by the *Roccella* there is abundance of minute *Verrucariæ* and *Graphidiæ*, with occasional *Parmeliæ*. Associated with *Verrucaria epidermis*, Mr. Currey has detected in Dr. Lindsay's specimens a new species of *Sphæria*, which Dr. Lindsay has called *Sphæria Kirkiana*. II. On the Parts involved in the Process of Defoliation. By Mr. W. R. M'Nab. The author showed that the process of defoliation was to be studied only by an examination of the development of the leaf. From off the plant appears a small mamilla or cushion, which the author called the phylloblast. This, at a certain stage, became differentiated into two parts, one near the axis—a stationary part—the other a rapidly-developing part attached to the axis, not directly, but through the lower part. The stationary lower part he called the hypophyll; the other, the epiphyll. The hypophyll developed the stipules from any part of its surface. The epiphyll developed the parts of the leaf proper—lamina and petiole. The stipules are thus not properly appendages of the petiole, but belong to a morphologically distinct part. In the leaves of deciduous plants (those with free lateral stipules being most typical, and in which the process is best seen) the leaf falls off so as to leave the stipules and hypophyll entire, as in *Cytisus Laburnum*, *Lirriodendrum tulipifera*, etc., the cicatrix being formed by the hypophyll. The author then maintains that the separation takes place between one part of the leaf and another—between hypophyll and epiphyll, and not between axis and leaf, as has generally been supposed to be the case. III. On Chinchona Cultivation in Ceylon. By Mr. Clements Markham. Mr. Markham, of the India Office, has been deputed by the Government to visit the planters along the western coast of India, and try to induce them to cultivate the Chinchona-tree, in order that a new source of supply of quinine may be obtained. He has been visiting and reporting on the Hakgalla Plantation, in Ceylon. IV. On Plants collected during a Tour in Ireland in 1865. By Mr. F. Naylor. Among the plants met with were—*Dabœcia polifolia*, *Erica Mediterranea* and *E. Mackaiana*, *Saxifraga hirta*, and various species of the Robertsonian Saxifrages, *Eriocaulon septangulare*, *Pinguicula grandiflora*, *Cyperus fuscus*, *Trichomanes radicans*, *Adiantum Capillus-Veneris*, etc. V. Report on the Flowering of Plants in the Open Air at the Royal Botanic Garden. By Mr. M'Nab.

Natural History Society of Dublin.—At the last meeting of this Society, Dr. David Moore, F.L.S., M.R.I.A., President, in the chair, Mr. W. Archer read a paper on *Bulbochæte Pringsheimiana*, sp. nov. (*Oospore elliptic;* dwarf male plants seated upon the oogonium, which they equal in length; oogonium bearing immediately above it the mother-cells of the androspores.) This minute plant belongs to a family of Chlorospermatous Algæ, containing two genera, rich in forms. They are mainly but simple filamentous plants—that is, composed of cells following one another in a simple branched or unbranched linear series, and of a bright green colour. That they should reproduce themselves by zoospores may not be surprising, this phenomenon having been now so long known in many Algæ; but they are also amongst those of the humbler Algæ, in which, thanks mainly to Pringsheim's masterly researches, a true reproductive process by the mutual co-operation of distinct sperm-cells and germ-cells—a true fertilized spore—was first known to be formed. With the exception of the species of *Œdogonium* and *Bulbochæte* described by Pringsheim and De Bary, I am not acquainted with those of any other author which I can regard as of any value. Indeed, the more advisable course seems to be to ignore them. Possibly my plant may have been described before; but, inasmuch as the distinctions put forward in *Œdogonieæ* are founded, not on the characters presented by the fructification, but simply on comparative dimensions of the vegetative parts, it would be impossible to be certain. Therefore, in the present instance, the only course seems to be to follow Pringsheim, and name the present plant on the characters offered by the reproductive organization. The fact is that it is quite possible that the true species in the *Œdogonieæ* are by no means so numerous as are the pseudo-species recorded in books, on what seem to be, at least comparatively, unessential characters. Pringsheim has indicated the plan which an observer, desirous to work out this group, should follow, which, if indeed it be seemingly the only correct one, has the disadvantage that the distinctions are necessarily founded on data comparatively so recondite as that an observer must trust to good fortune in obtaining the specimens in which the characters of the fructification are fully displayed. Dr. E. Perceval Wright said he had been struck by the description of the cell development in *Bulbochæte*, which differs in several respects from that described by Karsten in *Œdogonium*. But the most remarkable phenomenon by far was the development and growth of Pringsheim's "androspore." In this he could recognize nothing but a highly specialized bud or phytoid form. Physiologically it had nothing in common with a spore, and the name chosen was, he thought, an unhappy one, as it did not draw distinction enough between a sperm, the product of a true sperm-cell, and a bud, which, however much it might at first sight resemble a sperm, was destined to develope itself into a receptacle of antherozoids. The comparative physiologist could not fail to be struck with the similarity of this form of development with what is met with in some of the Hydrozoa. In both a highly differentiated portion of the organism separates as a motile bud,—in the one a phytoid, in the other a zooid form; in both, their destined function being to mingle their matured contents with the products of the germ-cells of the same species.



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DECADES OF BRITISH FUNGI.

BY M. C. COOKE, ESQ.

(PLATE XLV.)

DEC. I.-VII.

The fungi described in the following pages have been chiefly collected during the past twelve months. For several of these I am indebted to the assiduity of Dr. Edward Capron, of Shere, whose devotion to the study of microscopic fungi will, I trust, in the future, contribute materially to the number of species that I may have to include in the "Decades." The species enumerated by Messrs. Berkeley and Broome, in the 'Annals of Natural History' (vol. xv. April, May, June, 1865), will not be included, and, therefore, to those communications by my excellent friends the following may be regarded as supplemental:—

ERYSIPHEI.

I have to record several interesting additions to this group, two of which belong to a genus not before determined as British.

PODOSPHÆRA, *Kunze*. Mycelium effuse, web-like, evanescent. Conceptacles sphærical, containing one, subglobose, 8-spored sporangium. Spores ovate. Appendages few, dichotomous, thickened at their extremities, hyaline.—Léveillé in 'Annales des Sciences Naturelles.'

1. PODOSPHÆRA KUNZEI, *Lév.* Amphigenous. Conceptacles minute, scattered, globose. Appendages three times the length of the diameter of the conceptacles.—Lév. Ann. Sc. Nat. 1851, xv. p. 135. *Alphitomorpha tridactyla*, Wallr. Fl. Crypt. ii. p. 758. *Erysibe tridactyla*, Rabh. D. Krypt. Fl. p. 237; Desmz. Ann. Sc. Nat. ser. 3. t. iii. p. 361. *Erysibe Brayana*, Weigt. Reg. Bot. Zeit. 1838, p. 473; Rabh. D. Krypt. Fl. p. 237.—On the leaves of *Prunus domestica*. Shere, near Guildford, September, 1865 (Dr. E. Capron). (Pl. XLV. Fig. 3, tip of appendage, × slightly.)

2. PODOSPHÆRA CLANDESTINA, *Lév.* Amphigenous. Conceptacles minute, globose, scattered. Appendages (8–10) equal in length to the diameter of the conceptacles. Branches short and rounded at their extremities.—Lév. Ann. des Sc. Nat. 1851, xv. p. 135. *Erysiphe Oxyacanthæ*, De Cand. Fl. Fr. vi. p. 106; Duby, Bot. Gall. 868; Cast.

Cat. p. 190; DR. and Mont. Fl. Alg. ii. *Alphitomorpha clandestina*, Wallr. Fl. Germ. ii. p. 754. *Erysibe clandestina*, Lk. Sp. Pl. p. 105. *Erysiphe clandestina*, Fr. Sys. Myc. p. 238.—On the leaves of Hawthorn. Kentish Town, September, 1864; Shere, near Guildford, September, 1865 (Dr. E. Capron). (Fig. 4, tip of appendage, × slightly.)

3. UNCINULA WALLROTHII, *Lév.* Amphigenous. Mycelium web-like, evanescent. Conceptacles minute, scattered. Sporanges 12–16, pear-shaped, 6-spored. Appendages numerous, twice the length of the diameter of the conceptacles.—Lév. Ann. des Sc. Nat. 1851, xv. p. 153. *Erysiphe Prunastri*, De Cand. Fl. Fr. vi. p. 108. *Alphitomorpha adunca*, β. *Prunastri*, Wallr. Verhand. i. p. 37. *Erysibe adunca*, var. 2. *Prunastri*, Lk. Sp. Pl. i. p. 111. *Erysiphe adunca*, β. *Prunastri*, Duby, Bot. Gall. p. 870; Fr. S. M. iii. p. 245. *Alphitomorpha adunca*, c. *Rosacearum*, Rabh. D. Krypt. Fl. p. 236 (partly).—On the leaves of *Prunus spinosa*. Shere, October, 1865 (Dr. E. Capron).—This species is very closely allied to *Uncinula adunca*, from which the length of the appendages, the number of sporanges and of the spores, with its evanescent mycelium, distinguish it.

4. MICROSPHÆRIA COMATA, *Lév.* Hypophyllous. Mycelium web-like, fugacious. Conceptacles scattered, minute, globose. Sporanges 8, ovate, with a beak-like termination at their base, 4-spored. Appendages few, six times the length of the diameter of the conceptacles.—*Calocladia comata*, Lév. Ann. des Sc. Nat. 1851, xv. p. 157; Cooke, Fung. Brit. Exs. n. 94. *Erysibe Euonymi*, De Cand. Fl. Fr. vi. p. 105. *Alphitomorpha comata*, Wallr. Fl. Crypt. ii. p. 757. *Erysibe comata* (*Euonymi*), Lk. Sp. Pl. ii. p. 114. *Erysiphe Euonymi*, Duby, Bot. Gall. p. 870. *E. penicillata*, ε. *Euonymi*, Fr. S. M. iii. p. 244. *Erysibe comata* (*Euonymi*), Rabh. D. Krypt. Fl. p. 231.—On the leaves of *Euonymus Europæus*. Shere, September, 1865 (Dr. E. Capron). (Fig. 5, tip of appendage, × slightly.)

5. ERYSIPHE HORRIDULA, *Lév.* Amphigenous. Mycelium web-like, sometimes persistent. Conceptacles minute, globose, scattered or clustered. Sporanges 20–24, oblong-ovate, attenuated downwards, containing 3–4 spores. Appendages short, flexuose, and bent upwards.—Lév. Ann. des Sc. Nat. 1851, xv. p. 170. *Alphitomorpha horridula*, var. α. *Asperifoliarum*, Wallr. Fl. Germ. ii. p. 755. *Mucor Erysiphe in Symphyto*, Leyss. Fl. Hol. p. 305. *Erysibe horridula*, ε. *Aspe-*

rifoliarum, Rabh. D. Krypt. Fl. p. 245.—On leaves of *Lycopsis arvensis*. Shere, October, 1865 (Dr. E. Capron).

SPHÆRIACEI.

6. DIATRYPELLA QUERCINA, *De Not.* Perithecia 8–15 in a group, black. Ostiola ovate, quadrisulcate. Asci linear-clavate. Sporidia numerous, yellowish in a mass, sausage-shaped, and colourless when free.—Schema di class. Sferiacei Ital. p. 28. *Sphæria quercina*, Pers. Syn. p. 24. t. 1. f. 7 b; Desm. Pl. Crypt. n. 1752. *Stromatosphæria quercina*, Grev. Fl. Ed. p. 358. *Diatrype quercina*, Tul. Sel. Fung. Carp. ii. p. 98 (non Berk. et Br., nec Currey); Rabh. Herb. Myc. n. 319, ex Duby.—On Oak branches. Common. (Fig. 2, ascus and sporidia, × 300.)

7. DIATRYPE SYNGENESIA, *Curr.* Perithecia not circinating, united by a distinct crust or stroma. Asci somewhat clavate. Sporidia biseriate or crowded, colourless, elliptic-acuminate; endochrome quadripartite, sometimes only bipartite, ·0005–·0006 in. long.—*Sphæria (Valsa) syngenesia*, Fr.; Currey in Linn. Trans. xxii. n. 123. t. 47. f. 119.—On Elder, Fife House, Whitehall, January, 1866.—The sporidia are precisely those figured by Mr. Currey in Linn. Trans., cited above, under the name of *Sphæria syngenesia*, Fr., and which he considers to belong to that species.—The specimen from which those sporidia were figured, was marked "*S. Frangulæ*, Pers. in litt.," by Mougeot, in the Kew Herbarium, and this is identified with *S. syngenesia*, by Fries in his 'Elenchus' (ii. p. 78). Messrs. Berkeley and Broome, on the other hand, contend that another *Sphæria*, called by them *Valsa syngenesia*, Fr., is the true *Sphæria syngenesia*, Fr., according as it evidently does with the figure given in Fries's 'Observations' (part ii. t. 7. f. 1). Hence we must conclude that Fries confounded two species, occurring on Elder, under the same name, through not having regard to the fruit, which in Messrs. Berkeley and Broome's species has minute sausage-shaped sporidia. I found during the past winter three distinct species of compound *Sphæriæ*, on fallen twigs of Elder; one of these corresponds with Messrs. Berkeley and Broome's species, one with Mr. Currey's species, and one to be hereafter referred to. Undoubtedly the species with minute sausage-shaped sporidia is a true *Valsa*, therefore the name adopted by Messrs. Berkeley and Broome is entitled to stand. The other appears to me, and also,

I believe, to Mr. Currey, to whom a specimen was sent, *not* to be a *Valsa* at all; since that gentleman observes, "I make out a distinct black crust or stroma, uniting the perithecia, which are effused and not arranged in circles, as in *Valsa*. It seems to me to belong to the *Concrescentes*. The fruit agrees with the figure of *Valsa syngenesia* in the Linn. Trans." Whether this is also the character of *Sphæria Frangulæ*, Moug., I am not in a position to say, therefore have not included it as a synonym of the present species.

The third species, which I found in the same locality, on Elder, was unfortunately confined to a single fragment of a stick. It approximated somewhat in habit to *Diatrypella quercina* and its allies; the asci were elongated and stipitate, containing numerous sausage-shaped sporidia. It seems to me to be sufficiently distinct to be regarded as a separate species, but I should not propose it as such upon the faith of a single specimen. Should it occur again, it could not have a more appropriate name than *D. affinis*, under which I have transferred it to my herbarium.

8. VALSA AMYGDALINA, n. sp.; peritheciis paucis (4–6), circinatis, atris, prominulis; collibus rectis convergentibus, non confluentibus, disco aurantio-claro convexo obtectis; ascis cylindricis; sporidiis uniserialibus, amygdaliformibus, hyalinis.—On small twigs of Hornbeam. Highgate, September, 1866. Forming dark bullate spots, caused by the black perithecia nestling beneath the thin epidermis, somewhat depressed around the ostiola, which are at first covered with a bright orange disk, at length naked. Perithecia from 4–6 in a group, black, with straight convergent necks, never confluent. Asci cylindrical, containing eight almond-shaped, large, uniseriate, hyaline sporidia, occurring sometimes on the same twigs as *Valsa bitorulosa*, B. and Br., from which it is distinguishable with the naked eye, by the dark prominent perithecia and bright orange disk. The sporidia closely resemble those of some *Pezizæ*. (Fig. 21, ascus and sporidia, × 300.)

9. VALSA THELEBOLA, *Fr.* Pulviniform or conical, depressed or subtruncate. Asci oblong. Sporidia biseriate, amber-coloured, with a greenish tint or hyaline, slightly curved, obtuse at the extremities, commonly ciliate at each end, uniseptate.—Curr. Linn. Trans. xxii. p. 280. t. 48. f. 157 and 159. *Sphæria thelebola*, Fr. S. M. ii. p. 408. n. 193. *Sphæria ditissima*, Tul. Ann. Sc. Nat. 1856, iii. p. 117. *Aglaospora thelebola*, Tul. Sel. Fung. Carp. ii. p. 166. t. 21. f. 1–18.

—On Alder. Irstead, Norfolk, September, 1865.—Unless care be exercised in the examination, the terminal cilia may be overlooked. (Fig. 8, ascus and sporidia, × 300.)

10. VALSA CERATOPHORA, *Tul.* Erumpent, splitting the epidermis in a somewhat stellate manner. Perithecia globose, with very long necks. Asci numerous, linear-oblong, 8-spored. Sporidia minute, sausage-shaped, pallid.—Sel. Fung. Carp. ii. p. 191. t. 22. f. 1–11. *Sphæria ceratosperma*, Moug. and Nest. Exs. n. 567; Fr. S. M. ii. p. 364 (partly); Curr. Linn. Trans. xxii. p. 292. t. 47. f. 93 (*fide* Tulasne). *Valsa coronata*, Duby in Rabh. Exs. (1860) n. 250.—On fallen Elm-branches. Fife House, Whitehall, January, 1866. (Fig. 1 *a*, section of group of perithecia; *b*, ascus and sporidia; *c*, free sporidia, ×300.)

* VALSA TETRATRUPHA, *B. and Br.*, var. *simplex.* Recently I collected specimens of a *Sphæria* on the slender twigs of a Willow, which appeared to me to be so distinct from every described species with which I was acquainted, that I named it provisionally *S. eustegiæ*, and some specimens were sent to correspondents under that name. Mr. Broome, however, is disposed to regard it as a form of *Valsa tetratrupha*. The perithecia are in the majority of instances single and scattered, occasionally two or three are confluent. The asci are cylindrical and 8-spored. Sporidia uniseriate, triseptate, but without any indications of transverse septa. Indeed, nothing can at first sight appear more distinct than this form, and the species to which it is referred. Mr. Broome has a far better knowledge of the species described by himself, in conjunction with the Rev. M. J. Berkeley, as *V. tetratrupha*, than I have, and therefore I am content to abide by his decision. (Fig. 20, ascus and sporidia, × 300.)

11. MASSARIA EBURNEA, *Tul.* Hypodermal, pulviniform or conical, depressed or subtruncate. Perithecia circinating, with long necks. Asci large, obovate-cylindrical, obtuse, 8-spored. Sporidia elliptical or broadly ovate, quadrilocular, constricted at the joints, obtuse, smooth, and pallid.—Tul. Sel. Fung. Carp. ii. p. 239. t. 25. f. 5–9. *Sphæria pupula*, var. *minor*, Desm. Pl. Crypt. Exs. (1851) n. 1764; Ann. Sc. Nat. (1852) xviii. p. 362. (Pycnides) *Septoria princeps*, B. and Br. Ann. Nat. Hist. 1861, vii. p. 380. t. 15. f. 11.—On Beech. Shere, January, 1866 (Dr. E. Capron). (Fig. 9, sporidia, × 300.)

* NECTRIA PUNICEA, *Rabh.* I have found upon twigs of *Rhamnus*

Frangula a *Nectria*, which agrees in every respect with the specimens published by Dr. Rabenhorst under this name (Fung. Europ. Ex. n. 634), but do not find any character whereby it can merit separation from *Nectria cinnabarina*, Fr., or, at least, what I take to be that species, which is found so commonly with *Tubercularia vulgaris* (its barren condition) upon dead twigs of Currant. I do not know wherein Dr. Rabenhorst regards his species as distinct, there is evidently no difference in the fruit, and very little in the habit.

12. SPHÆRIA DIPLOSPORA, *n. sp.*; erumpentes; cæspitosæ; peritheciis subglobosis, papillatis, in tuberculis rimosis prominentibus corticis nidificantibus; ascis elongatis, octosporis; sporidiis uniseriatis, ellipticis, uniseptatis, brunneis, in forma *Diplodiæ.*—On stems of Bramble. Shere, February, 1866 (Dr. E. Capron). Cæspitose and erumpent, bursting through elongated fissures in the bark. Perithecia subglobose, distinctly papillate, black. Asci elongated and 8-spored. Sporidia uniseriate, large, brown, and uniseptate, identical with the sporidia of *Diplodia Rubi*, Fr., scarcely constricted at the septum. (Fig. 7, sporidia, × 300.)

13. SPHÆRIA ABBREVIATA, *n. sp.*; peritheciis minutis, lineas breves aggregatas efformantibus, convexis, papillatis, demum perforatis; ascis abbreviatis, late ellipticis; sporidiis congestis, oblongis, triseptatis, torulosis, brunneis.—On dead stems of Bramble. Wandsworth Common, April, 1864; Shere, January, 1866 (Dr. E. Capron).—Perithecia minute, arranged in short parallel lines, but not confluent, convex at first, papillate, but ultimately perforated at the apex. Asci very short and broad, elliptical, pyriform or obovate. Sporidia crowded together, oblong, triseptate, slightly torulose, pale brown when mature. A very distinctly-marked species, of which I can find no description. The linear arrangement of the perithecia and the singularly abbreviated asci are too distinct to permit of their not being observed. If this is really *S. clypeata*, Fr., which I do not know, the name here applied should stand, there being another *S. clypeata*, N., also found on Bramble. (Fig. 6, asci and sporidia, × 300.)

* SPHÆRIA RUBORUM, *Libert*, Exs. n. 340 (1837). *Sphæria rubicola*, Curr. in Linn. Trans. (1859), xxii. p. 319. fig. 48; Berkl. Outl. p. 399; Cooke, Index Fung. Brit. n. 2224. Having compared the specimens published by Madame Libert with the rubicolous species found in this country, and which I have no doubt is that which Mr.

Currey had in view, I find no distinction whatever between them, therefore *Sphæria rubicola*, Curr., must give way before the much older name proposed by Madame Libert. M. Westendorp is certainly mistaken in referring *Sphæria Ruborum*, Lib., to *Sphæria callimorpha*, Mont.

14. SPHÆRIA ALLIARIÆ, *Aswd*. Asci somewhat clavate (more nearly cylindrical), 8-spored. Sporidia slightly curved, 3–5-septate, the middle dissepiment often a little constricted.—Rabh. Fungi Europæi Exs. n. 261. *S. doliolum*, Pers. (partly). On stems of *Erysimum Alliaria*. Shere, Feb. 1866 (Dr. E. Capron.)—This species is almost too closely allied to *S. doliolum*. The matrix is very much blackened in all the specimens examined, and the form and arrangement of the perithecia differ slightly from that species. Professor de Notaris does not appear to recognize it as distinct. (Fig. 19, ascus and sporidia, × 300.)

15. SPHÆRIA (GNOMONIA) PETIOLI, *Fuckel*. Simple, gregarious; perithecia always covered, globose; epidermis inflated, black. Ostiole prominent, flexuose, terete, thickened at the base, double the length of the perithecium, blackish. Asci clavate, 8-spored, sporidia narrowly fusiform, 3–5-septate hyaline.—Fungi Rhenani Exs. n. 537; Enum. Fung. Nass. p. 68; De Not. Schema di Class. p. 49.—On petioles of *Acer Pseudo-platanus*. Sydenham, 1863; Holly Lodge, Highgate, Feb. 1866. Not uncommon.—Closely allied to *S. setacea*, although Professor de Notaris places it in a different genus. (Fig. 18, ascus and sporidia, × 300.)

16. SPHÆRIA ARAUCARIÆ, *n. sp.*; maculis pallidis; peritheciis amphigenis, sparsis, tectis, sub epidermide elevatis, demum depressis, perforatis; ascis linearibus; sporidiis uniseriatis, ellipticis, uniseptatis, hyalinis vel melleis.—On dead leaves of *Araucaria imbricata*. Neatishead, Norfolk, Sept. 1865.—Seated on pallid spots. Perithecia on either or both surfaces, scattered, covered by the epidermis, at first raising the epidermis in small dark pustules, at length depressed in the centre and perforated. Asci linear. Sporidia uniseriate, elliptical, uniseptate, slightly constricted, obtuse at the extremities, and hyaline or pale amber colour. (Fig. 12, ascus and sporidia, × 300.)

* SPHÆRIA EPIDERMIDIS, *Fr*. The specimens of this plant which I have recently collected on bramble stems, are in the majority of instances tetrasporous, a few 8-spored asci being found mixed with those containing only 4. In all other points this *Sphæria* accords with

Messrs. Berkeley and Broome's interpretation of the *S. epidermidis* of Fries, having uniseptate, elliptical, brown sporidia. It is one of the species concerning which great confusion has existed, and to which many very different plants have been referred. (Fig. 10, tetrasporous asci, × 300.)

17. SPHÆRELLA ISARIPHORA, *De Not.* Epiphyllous. Perithecia very small, globose, depressed, scattered, black, often concealed beneath the epidermis. Ostiola poriform. Asci elongated, containing the oval or oblong sporidia, which are almost colourless, uniseriate, and uniseptate. —Schema di Class. Sfer. Ital. p. 63. *Sphæria isariphora,* Desmz. Mém. Soc. Roy. de Lille, 1843; Pl. Crypt. Exs. n. 1291; West. Bull. de Brux. 1850, n. 27.—On dead leaves of *Stellaria holostea.* Common.—M. Desmazières observes that this species often supports a minute parasitic *Isaria,* whence its name. I have never been able to find such a parasite, although I have sought for it diligently. M. Westendorp makes a similar observation of want of success in verifying the fact. (Fig. 11, ascus and sporidia, × 300.)

PUCCINIÆI.

* TRICHOBASIS HYDROCOTYLES, *Cooke* in Seemann's Journ. Bot. ii. p. 344; Micro. Fungi, p. 209; Fungi Brit. Exs. n. 69. *Uredo Hydrocotyles,* Bertero; Mont. Fl. Fernand. n. 59; Fl. Chil. viii. p. 50; Ann. Sc. Nat. 1835; Mont. Syll. p. 315; Desmz. Pl. Crypt. Exs. n. 2123; Ravenal, Fung. S. Carolina.—A comparison of specimens enables me to add with confidence the above synonyms to the account already published.

* TRICHOBASIS PARNASSIÆ, *Cooke* in Seem. Journ. Bot. ii. p. 344; Micro. Fungi, p. 210; Fungi Brit. Exs. n. 74. *Uredo Parnassiæ,* West. in Bull. de Brux. xix. n. 87; Herb. Crypt. Belge, n. 676. —Authentic specimens received from M. Westendorp place it beyond doubt that my plant is the same as that found in Belgium. It is nevertheless a true *Trichobasis,* with evanescent peduncles to the fruit, and cannot belong to *Uredo* as that genus is now understood.

* TRICHOBASIS RHAMNI, *Cooke* in Seem. Journ. Bot. ii. p. 344; Micro. Fungi, p. 210.—Since the accounts quoted were published, I have found a *Puccinia,* mixed with *Trichobasis,* on the same leaves, which cannot be distinguished from *Puccinia prunorum,* Lk. Therefore this cannot be maintained as a distinct species.

18. TRICHOBASIS FALLENS. Spots obliterated. Sori amphigenous, numerous, scattered, subrotund, brown, surrounded by the remains of the ruptured epidermis. Spores subovate, pedicels short, hyaline, evanescent; epispore verrucose.—*Uredo fallens*, Desmz. Ann. des Sc. Nat. ser. 3. iii. p. 357; Pl. Crypt. Exs. ed. i. n. 1325. ed. ii. n. 725.—On leaves of clover, etc., Sept. 1865. Neatishead, Norfolk, and elsewhere. On *Vicia sepium*, intermixed with the *Puccinia* hereafter described, near Liverpool (R. G. M'Leod).—Though this is undoubtedly nothing more than the *Uredo*-form of *Puccinia fallens*, I have preferred assigning it a name until a revision of the whole of this Order takes place, and the forms under which the same species occurs cease to be designated by different names, and become associated together under their proper designation.

19. PUCCINIA FALLENS, *n.sp.;* maculis obliteratis; soris amphigenis, paucis, sparsis, rotundatis; sporidiis obovatis, longe pedicellatis, fulvis, vix constrictis, episporio lævi.—On *Vicia sepium*, near Liverpool, autumn, 1865 (R. G. M'Leod). Sori few and small, scattered, intermixed with pustules of *Trichobasis*. Sporidia obovate, on rather long pedicels of a tawny colour, and slightly constricted at the septum. Epispore smooth.—Apparently not common, and as far as I can ascertain, undescribed.

20. PUCCINIA VIRGAUREÆ, *Lib.* Spots orbicular, pallid, then yellowish. Sori blackish-brown, minute, punctiform, shining, clustered, nearly stellate, convex. Sporidia oblong, subconstricted, yellowish-brown above, attenuated and yellowish-white below. Peduncles short.—Libert, Pl. Exs. n. 393; Corda, Icones Fung. iv. t. 5. f. 42. Rabh. D. Krypt. Fl. p. 24; Cooke, Fungi Brit. Exs. n. 45. *Dothidea solidaginis*, *β*. Fr. S. M. ii. p. 362. *Xyloma*, De Cand. Mém. du Mus. d'Hist. Nat. t. 3. f. 12. *Asteroma atratum*, Chev. Fl. Par. p. 449.—On leaves of *Solidago Virgaurea*. Shere, August, 1865 (Dr. E. Capron).—A very distinct and interesting species.

21. PUCCINIA DISCOIDEARUM, *Lk.* Spots obliterated. Sori subrotund, minute, surrounded by the remains of the ruptured epidermis. Sporidia brown, oblong or ovoid, somewhat rhomboidal, with both cells attenuated and triangular, peduncles elongated.—Link, Sp. Pl. ii. p. 73; Corda, Icones Fung. iv. t. 4. f. 43; Cooke, Fungi Brit. Exs. n. 35. *P. Tanaceti*, De Cand. Fl. Fr. ii. p. 222; Fuckel, Fungi Rhen. Exs. n. 341. *P. Absinthi*, De Cand. Fl. Fr. vi. p. 58. *P. Arte-*

misiarum, Schm. and Kze. Exs. n. 93. *P. Artemisiæ*, Fuckel, F. Rhen. Exs. n. 350.—On *Artemisia maritima*. Swanscombe, Kent, September, 1865.—Many authors unite this species with *Puccinia Compositarum*, but from them I dissent, not from any desire to augment the number of British species, but because I recognize in both its *Puccinia*-form, and what I believe to be its *Uredo*-form, a distinctness which entitles it to be separated from the numerous forms still associated under *P. Compositarum*.

22. PUCCINIA ARUNDINACEA, *Hedw.* Amphigenous. Sori elongated, often confluent, emersed, convex, prominent. Sporidia brown, attenuated in both directions, constricted at the joints, apiculate, on long pedicels.—Hedw. fil. in Duby, Bot. Gall. ii. p. 889; Corda, Icones Fung. iv. t. 3. f. 30; Cooke, Fungi Brit. Exs. n. 25. *P. graminis*, var. *arundinis*, Cooke, Micro. Fung. p. 196.—On *Arundo Phragmites*. Common.—The true *Puccinia graminis*, Pers., occurs also on reeds, but the habit is very different, the sori are smaller and more numerous, and the spores more closely resemble those of the same species when growing on the cereals than the spores of this species. Having found both species in the same locality, and even upon the same plant, still maintaining a distinct character, I am disposed to accept them as specifically different, in which view I do not thin kthat I am alone.

* UROMYCES CONCENTRICA, *Lév.* Ann. des Sc. Nat.; Cooke, Fung. Brit. Exs. n. 76. *U. concentricus*, Fuckel in Sched. *U. Scillæ*, Fuckel, Fungi Rhen. Exs. n. 401. *Uredo concentrica*, Desmz. Ann. des Sc. Nat. ser. 3. t. vi. p. 62; Pl. Crypt. Exs. n. 1478; West and Wall, Herb. C. Belg. n. 675. *Trichobasis Scillarum*, Berk. Outl. p. 332; Cooke, Micro. Fungi, p. 208; Index Fung. Brit. n. 1335. *Uredo Scillarum*, Grev. in Hook. Herb.; Berk. Eng. Fl. v. part 2. p. 376. *Uredo Muscari*, Duby, Bot. Gall. ii. p. 838? *Puccinia Scillarum*, Baxter, Exs. n. 40.—On leaves of *Scilla nutans*. Bala, N. Wales, May, 1865.—This species appears to me to be an exceedingly good *Uromyces*, and not by any means, either in habit, or form and colour of the spores, entitled to be regarded as a *Trichobasis*.

23. UROMYCES POLYGONI, *Fuckel.* Cauline. Sori elongated and confluent, convex, surrounded by the remains of the ruptured epidermis. Sporidia subglobose or globose, smooth, yellowish-brown; pedicels very long, thickened, hyaline, persistent.—Fuckel, Fungi Rhen. Exs. n. 399. *Capitularia Polygoni*, Rabh. Bot. Zeit. 1851, p. 449; Herb.

Myc. ed. i. n. 1995; Fung. Eur. n. 185. *Uredo longipes*, Lasch. *U. clavigera*, Lasch. fide Rabh. *Puccinia vaginalium*, Link, Sp. Pl. (in part.)—On the stems of *Polygonum aviculare*. Near Liverpool, August, 1865 (R. G. M'Leod); Swanscombe and Northfleet, Kent; Hampstead and Highgate, October, 1865.—I do not see that this species offers any features whereby its separation from *Uromyces* can be maintained. Hence I have not adopted Dr. Rabenhorst's genus *Capitularia*. The same may be said of Fuckel's genus *Puccinella*, which I believe that author himself has abandoned.

24. Uromyces graminum, *n. sp.;* epiphyllis; soris oblongis vel confluentibus, convexis, nitidis, atris, demum longitudinaliter fissuratis; sporidiis subglobosis vel ovatis, fuscis; pedicellis nunc brevibus, nunc elongatis, hyalinis.—On leaves of *Dactylis glomerata*. Shere, October, 1865 (Dr. E. Capron).—Epiphyllous, on both surfaces. Sori oblong, or confluent and linear, convex, black and shining, so as easily to be confounded on casual observation with *Dothidia graminis*, P., at length bursting longitudinally. Sporidia subglobose or ovate, tawny, with hyaline pedicels of variable length. This is undoubtedly the *Uromyces*-form of *Puccinia graminis*, although I have not hitherto been able to trace the connection. It seems strange that it should have hitherto been apparently unnoticed.

25. Uromyces sparsa, *Lév.* Spots pallid. Sori subrotund and oval, amphigenous and cauline; epidermis erumpent. Sporidia ovoid, brownish; peduncles thickened, short.—Lév. Ann. des Sc. Nat. 1847, viii. p. 369; Fr. Summ. 514. *Uredo sparsa*, Kze. and Schm. Exs. n. 170; Rabh. D. Krypt. Fl. n. 39. *Cæoma sparsum*, Link, Sp. Pl. ii. p. 27.—On *Spergularia rubra*. Swanscombe Marshes. Very sparingly.

26. Uredo Euonymi, *Mart.* Spots yellowish. Sori roundish, circinating, often confluent; epidermis erumpent. Sporidia ovoid and slightly coherent, tawny-yellow.—Mart. Fl. Mosq. p. 230; Rabh. D. Krypt. Fl. p. 7. *U. circinalis*, Strauss (in part). *Cæoma Ribesii*, Link, Sp. Pl. ii. p. 28 (in part).—On leaves of *Euonymus Europæus*. Darenth Wood, Kent, August, 1864. Very scarce.—Nearly allied to *Uredo confluens*, P.

* Uredo Padi, *Kze.* Exs. n. 187; Berk. and Broome, Ann. Nat. Hist. 1865, xv. p. 401. *U. porphyrogenita*, Link, Sp. ii. p. 31; Cooke, Micro. Fungi, p. 205. The priority of name is in favour of *U. Padi*, Kzes., adopted by Messrs. Berkeley and Broome. I refer to

it now lest any one should be misled into the belief that the two names represented distinct species, as those gentlemen did not quote *U. porphyrogenita* as a synonym.

27. Uredo Orchidis, *Mart.* Amphigenous. Spots reddish-brown. Sori subrotund, arranged in circles, often confluent. Sporidia subglobose, golden-yellow.—Mart. Fl. Mosq. 229; Cooke, Fungi Brit. Exs. n. 61. *Uredo confluens*, *γ. Orchidis*, Alb. and Sch. p. 122. *Uredo circinalis*, *a. Orchidis*, Strauss, Wett. Ann. ii. 88. *Cæoma Orchidum*, Lk. Sp. Pl. ii. p. 9.—On leaves of *Listera ovata* and *Orchis latifolia*. Crosby, near Liverpool, June, 1865 (R. G. M'Leod).

28. Uredo Empetri, *De Cand.* Hypogenous. Spots obliterated. Sori oval, scattered, the epidermis at first convex, afterwards ruptured and concave. Sporidia ovoid or subglobose, bright yellow.—De Cand. Fl. Fr. vi. p. 87; Moug. and Nest. Exs. n. 391. *Cæoma Empetri*, Lk. Sp. Pl. ii. p. 16.—On *Empetrum nigrum*. Near Llanderfel, North Wales, May, 1865.

29. Uredo Tropæoli, *Desmz.* Hypogenous. Spots pale yellow Sori minute, roundish, scattered or confluent. Sporidia ovoid or subglobose, orange.—Desmz. Ann. des Sc. Nat. 1836, vi. p. 243; Pl. Crypt. Exs. ed. i. n. 837, ed. ii. n. 37.—On leaves of *Tropæolum aduncum*. Shere, October, 1865 (Dr. E. Capron).

30. Cystopus spinulosis, *De Bary.* Conidia in time much elongated. Sori erumpent, on both surfaces of the leaves, white. Oospores globose, epispore brown, tubercles minute, solid, very prominent, often acute and spinulose.—De Bary, Ann. des Sc. Nat. 1864, xx. p. 133; Cooke, Fungi Brit. Exs. n. 89.—On *Cirsium arvense*. Bungay, Suffolk, on the estate of W. Hartcup, Esq., Sept. 1, 1865. Probably not uncommon.

SPHÆRONEMEI.

Although perfectly satisfied that the majority of species included in this Order are nothing more than conditions of ascigerous fungi, I have not hesitated to record such as have come under my own observation, with the names by which they are commonly recognized, because in any future and more satisfactory arrangement these forms can be more easily referred to under definite names, and moreover the species to which they truly belong is, in many cases, only suspected.

31. Phoma glandicola, *Lév.* Conceptacles gregarious, erumpent,

subglobose, smooth, black, surrounded by the lacerated epidermis. Ostiolum scarcely conspicuous. Sporidia minute, ovate, simple, pellucid. —Lév. in Ann. Sc. Nat. 1846, v. p.2 81. *Sporonema glandicola*, Desm. —On acorns which had lain some time on the ground. Chichester, 1864; Hampstead, January, 1866. (Fig. 14, sporidia, × 300.)

32. PHOMA PETIOLORUM, *Rob.* Perithecia scattered, globose or ovate, black, covered by the epidermis, papillate, at length pierced with a terminal pore. Nucleus whitish. Sporidia minute, ovoid-oblong, with two nucleoli.—Desmazières in Ann. des Sc. Nat. 1847, viii. p. 16. West. and Wall. Herb. Crypt. Belge, n. 471.—On petioles of the leaves of *Robinia Pseudacacia.* Swanscombe, February, 1866. (Fig. 13, sporidia, × 300.)

33. DIPLODIA RUBI, *Fr.* Perithecia scattered, covered with the epidermis, prominent, semiglobose, black. Sporidia elliptical, dark brown, rather opaque, uniseptate. Sometimes the perithecia are arranged in short lines, in which state it resembles externally *Sphæria abbreviata*, above described.—Summ. Veg. Scan. p. 417; Fuckel, Fung. Rhen. Exs. n. 536.—On bramble. Shere (Dr. E. Capron); Highgate and Hampstead, autumn, 1865.

34. DIPLODIA ÆSCULI, *Lév.* Perithecia innate, globose, black within, covered by the fissured epidermis. Sporidia elongated, opaque, brown and uniseptate.—Ann. des Sciences Nat. 1846, v. p. 290; Fuckel, Fung. Rhen. Exs. n. 1563.—On fallen twigs of *Æsculus Hippocastanum.* February, 1866.

35. HENDERSONIA ROBINIÆ, *West.* Perithecia reddish-brown, either isolated and scattered, or united in a linear series. Ostiola very small and papillæform. Sporidia numerous, brown, oblong or elliptical, with 6 or 8 transverse septa, here and there united by longitudinal septa.—Westendorp in Bullet. de Brux. ser. 2. ii. n. 8.—On branches of *Robinia Pseudacacia.* Swanscombe, Kent, February, 1866.—Externally it has considerable resemblance to *Sphæria elongata*, which occurs on the same sticks, and of which this is doubtless merely a condition. The sporidia are only about two-thirds the length and diameter of those of the *Sphæria.* (Fig. 17, sporidia, × 300.)

36. HENDERSONIA ROSÆ, *West.* Perithecia commonly scattered over bleached spots, small, black, and prominent, covered by the epidermis. Sporidia elliptical, triseptate, brown, slightly constricted at the septa.—West. Bull. de Brux. ser. 2. ii. n. 9; Fr. Summ. Veg.

Scand. p. 416?—On bramble stems, sometimes accompanied by *Sphæria abbreviata*. February, 1866.—There seems to be very little difference between the plant described by Westendorp, but which I have not seen, and the above, except that the form occurring on bramble has brown sporidia, they are, however, by no means opaque, and I think it better to include it under the above name than propose it as a new species. It is intimately associated with the *Sphæria* already described as *Sphæria abbreviata*, the mature sporidia of which are almost identical with those of the present plant.

37. Hendersonia Corni, *Fuckel*. Perithecia globose, at first covered by the epidermis, black. Sporidia, with long deciduous pedicels, oblong, subclavate, obtuse, four-celled, yellow, the cell next the stem hyaline.—Fuckel, Fung. Rhen. n. 524; Enum. Fung. Nassov. p. 50. n. 416. fig. 16.—On twigs of *Cornus*. Bishop's Wood, Hampstead, May, 1864; Millfield Lane, Highgate, February, 1866. (Fig. 16, sporidia, × 300.)

38. Hendersonia sarmentorum, *West*. Perithecia immersed, flattened, dark brown, concealed by the epidermis, which is at length lacerated above the poriform ostiole. Sporidia brown, pear-shaped, obovate, elliptical or irregular, triseptate, with hyaline pedicels.—Westendorp in Bullet. de Brux. xviii. n. 60. fig. 2.—On dead twigs of Vine. Highgate, February, 1866.—The sporidia are very variable in my specimens. (Fig. 15, sporidia, × 300.)

39. Septoria pyricola, *Desm*. Epiphyllous. Spots greyish-white, scattered, roundish or irregular. Perithecia few, minute, rather prominent, black, pierced at the apex. Tendrils whitish. Sporidia elongated, curved, containing several nucleoli.—Ann. des Sc. Nat. ser. 3. xiv. p. 115. *Depazea pyricola*, Desmz. Pl. Crypt. n. 721. *Septoria Pyri*, Cast. Cat. Pl. de Mars, p. 194. *Septoria dealbata*, Lév. Ann. des Sc. Nat. ser. 3. ix. p. 249 (partly).—On leaves of Apple and Pear. Shere, October, 1865 (Dr. E. Capron); Highgate, November, 1865. (Fig. 27, sporidia, × 300.)

40. Septoria Viburni, *West*. Epiphyllous. Spots roundish or irregular, becoming whitish in the centre, with a brownish border. Perithecia minute, semiemergent, black, pierced at the apex. Tendrils white. Sporidia cylindrical, obtuse at their extremities, containing from 5 to 7 nucleoli.—Westendorp in Bullet. de Brux. 1852, xix. part iii. p. 121; Bell. Cat. Crypt. Namur, n. 350.—On the leaves of

Viburnum Opulus and *V. Lantana*. Highgate and Darenth Wood, October, 1865.—My specimens are identical with those received from Dr. Westendorp.

41. SEPTORIA UNEDINIS, *Rob.* Epiphyllous. Spots small, numerous, irregular, whitish with a broad purplish margin. Perithecia few, scarcely prominent, blackish, convex, then collapsing and becoming concave. Sporidia elongated, slender and curved.—Desmz. Ann. des Sc. Nat. ser. 3. iii. 1847, p. 20; Pl. Crypt. Exs. ed. i. n. 1713.—On leaves of *Arbutus Unedo*. October and November, 1865, Hampstead and Highgate. Probably very common. (Fig. 24, sporidia, × 300.)

42. SEPTORIA HYDROCOTYLES, *Desmz.* Epiphyllous. Spots irregular, rufous or brownish, then pallid. Perithecia minute, innate, pierced with a terminal pore. Tendrils whitish. Sporidia linear, curved, containing numerous opaque nucleoli.—Ann. des Sc. Nat. ser. 2. xvii. p. 109; Pl. Crypt. Exs. ed. i. n. 1175, ed. ii. n. 675.—On fading leaves of *Hydrocotyle vulgaris*. Common. Summer. (Fig. 31, sporidia, × 300.)

43. SEPTORIA FICARIÆ, *Desmz.* Amphigenous. Spots roundish or confluent, pallid, cinereous in the centre, with an irregular brownish margin. Perithecia innate, very small, black, convex, at length plane. Tendrils white. Sporidia linear, straight or curved.—Ann. des Sc. Nat. ser. 2. xv. p. 135; Pl. Crypt. Exs. ed. i. n. 1087. *Rhabdospora Ficariæ*, Mont. Fl. Alg. i. p. 596.—On leaves of *Ranunculus Ficaria*. Spring. Common. (Fig. 26, sporidia × 300.)

44. SEPTORIA MENYANTHES, *Desmz.* Amphigenous. Spots tawny-rufous, irregular. Perithecia very minute, of the same colour, pierced with a terminal pore. Tendrils white. Sporidia linear, straight or curved, nucleoli scarcely distinct.—Ann. des Sc. Nat. ser. 3. xx. p. 89. 1853; Pl. Crypt. Exs. ed. i. n. 2178, ed. ii. n. 1828. *Ascochyta Menyanthis*, Libert, Exs. n. 251; Lasch. in Rabh. Exs. n. 860.—On fading leaves of *Menyanthes trifoliata*. Bungay (Mr. D. Stock).

45. SEPTORIA CLEMATIDIS, *Rob.* Amphigenous. Spots greyish, with a brownish border, rounded, angular or irregular. Perithecia on the upper surface, very minute, innate, scarcely prominent, pallid-brown, pierced with a terminal pore. Tendrils whitish. Sporidia elongated, curved or flexuose, with numerous nucleoli.—Desmz. Ann. des Sc. Nat. ser. 3. xx. p. 93 (1853); Pl. Crypt. Exs. ed. i. n. 2186, ed. ii.

n. 1836.—On leaves of *Clematis Vitalba*. Darenth and Swanscombe, Kent. Common. Summer and Autumn.

46. Septoria Epilobii, *West.* Amphigenous. Spots olivaceous, irregular or angular, limited by the veins of the leaves, or confluent. Perithecia on both surfaces, very small, brown, pierced with a terminal pore. Tendrils white, very delicate. Sporidia elongated, slender, straight, curved or flexuose, with numerous nucleoli.—Bullet. de Brux. 1852, xix. part iii. p. 120; Bell. Cat. Crypt. Namur, n. 324; Desmz. Ann. des Sc. Nat. ser. 3. xx. (1853) p. 94; Pl. Crypt. Exs. ed. i. n. 2188, ed. ii. n. 1838.—On living leaves of *Epilobium*. Darenth Wood, 1865; Shere (Dr. E. Capron).

47. Septoria Rosarum, *West.* Epiphyllous. Spots small, round, scattered, pallid, surrounded by a purplish border. Perithecia rare, semiemergent, blackish. Tendrils whitish. Sporidia flexuose, cylindrical, obtuse at the extremities, with from 3 to 6 nucleoli.—Bullet. de Brux. 1851, p. 396. *Septoria Rosæ, β. minor*, West. and Wall. Herb. Crypt. Belge, n. 426.—On living leaves of Roses in gardens. Hampstead and Highgate, 1865.

48. Septoria Sedi, *West.* Epiphyllous. Spots circular, greyish. Perithecia numerous, minute, nearly black, scattered over the spots pierced with a terminal pore. Tendrils white. Sporidia linear, usually straight or slightly curved, with about five nucleoli.—Bullet. de Brux. ser. 2. ii. n. 107; Herb. Crypt. Belge, n. 943. *Ascochyta Sedi*, Libert, Exs. n. 249.—On leaves of *Sedum Telephium*. Bungay, September, 1865. (Fig. 29, sporidia, × 300.)

49. Septoria Sorbi, *Lasch.* Epiphyllous. Perithecia minute, aggregate, semi-innate, nearly black. Sporidia elliptic, slightly pointed at the extremities so as to be almost almond-shaped.—Lasch. in Klotsch. Herb. Myc. n. 459. *Depazea sorbicola*, Rabh. Fungi Eur. Exs. n. 548.—On leaves of *Sorbus Aucuparia*. Hampstead, Shere, etc., autumn, 1865. Common. (Fig. 25, sporidia, × 300.)

50. Septoria Fraxini, *Desmz.* Epiphyllous. Perithecia minute, black, semi-innate, clustered together in irregular spots. In this respect it differs from *S. Sorbi*, in which the perithecia are aggregated about the margin of the leaves. The habit is very different from that of *S. Badhami*, with which some authorities have associated it. Sporidia cylindrical, truncate at the extremities, containing numerous nucleoli. —Desmz. Pl. Crypt. n. 1086; West. Bullet. de Brux. xviii. n. 76;

Fr. Elench. ii. p. 119. n. 3. *Septoria Badhami*, var. β. *Fraxini*, Awd. in Rabh. Fungi Eur. Exs. n. 852.

51. SEPTORIA CHELIDONII, *Desmz.* Amphigenous. Spots grey, whitish, or of a brownish tint. Perithecia innate, minute, nearly black, pierced with a large apical pore. Tendrils yellowish. Sporidia elongated, linear, straight, or curved, with several nucleoli.—Pl. Crypt. Fr. Exs. n. 1176. *Ascochyta Chelidonii*, Libert, Exs. n. 57. *Spilosphæria Chelidonii*, Rabh. Exs. 552.—On leaves of *Chelidonium majus*. Shere (Dr. E. Capron).

52. SEPTORIA SCABIOSÆCOLA, *Desm.* Amphigenous. Spots orbicular, of a violet-brown, marked in the centre with a white point which bears the solitary perithecium containing the elongated sporidia.—Ann. des Sc. Nat. 1853, xx. p. 96. *Depazea scabiosæcola*, Desmz. Exs. ed. i. n. 722, ed. ii. n. 179. *Sphæria lichenoides*, var. *scabiosæcola?* De Cand. Fl. Fr. Supp. *Depazea purpurascens*, var. *Scabiosæ*, Kickx, Fl. Crypt. de Louv. *Ascochyta Scabiosæ*, Rabh. Herb. n. 1253. *Spilosphæria Scabiosæ*, Rabh. Exs. n. 557.—On leaves of Scabious. Autumn. Common.

53. SEPTORIA SCLERANTHI, *Desmz.* Spots obliterated. Perithecia densely scattered, rather prominent, convex, black. Ostiole minute, conical. Sporidia linear, slightly curved, nucleoli scarcely distinct. —Bull. Soc. Bot. Fr. 1857, p. 861; Pl. Crypt. Exs. ed. ii. n. 689. —On all parts of *Scleranthus annuus*. Summer and autumn, Bungay (Mr. D. Stock). (Fig. 30, sporidia, × 300.)

54. SEPTORIA GEI, *Desmz.* Amphigenous. Spots orbicular or irregular, brown at first, cinereous when dry, with a purplish-brown margin. Perithecia on the upper surface, very minute, numerous, brownish-black, sometimes arranged along the veins of the leaves, at first hemispherical, becoming at length concave. Sporidia linear, flexuose.—Ann. des Sc. Nat. 1843, xix. p. 342. *Sphæria lichenoides*, var. *geicola*, De Cand. Fl. Fr. Supp. p. 149. *Sphæria (Depazea) vagans, geicola*, Fr. S. M. ii. p. 532. *Acrotheca Gei*, Fuckel, Enum. Pl. Nass. p. 43.—On leaves of *Geum urbanum*. Shere, autumn, 1865 (Dr. E. Capron).

55. SEPTORIA LYSIMACHIÆ, *West.* Epiphyllous. Spots indeterminate, brown. Perithecia minute, scattered, terminated by a pore. Tendrils whitish. Sporidia linear, straight, with numerous nucleoli.—Bull. de Brux. 1852, iii. p. 120; Bell. Cat. Crypt. Nam. n. 333. *Asco-*

chyta Lysimachiæ, Lib. Exs. n. 253. On leaves of *Lysimachia Nummularia*. Darenth, 1865.

56. Septoria castanæcola, *Desmz.* Amphigenous. Spots tawny, indeterminate. Perithecia on the under surface, brownish-black, minute, numerous, somewhat innate, pierced with a terminal pore. Tendrils whitish. Sporidia elongated, slender, curved.—Ann. des Sc. Nat. 1847, viii. p. 26; Fuckel, Fung. Rhen. n. 508.—On fading leaves of *Castanea vesca*. Ascot, September, 1865.

57. Septoria Ribis, *Desmz.* Amphigenous. Spots numerous, small, irregular and angular, of a pale brown or purple colour. Perithecia innate, very small, blackish-brown, convex, pierced with a large apical pore. Tendrils flesh-colour, or roseate. Sporidia elongated, linear, containing numerous nucleoli.—Mém. de la Soc. des Sc. de Lille, 1842; Pl. Crypt. Exs. n. 1179. *Ascochyta Ribis*, Libert, Exs. n. 53, West. and Wall. Herb. Crypt. Belge, n. 92. *Phlæospora Ribis*, Westendorp, Bull. de Brux. 1850, p. 20.—On leaves of Black Currant. Common. (Fig. 32, sporidia, × 300.)

58. Septoria alnicola, *n. sp.*; amphigenis; maculis rotundatis, pallido-brunneis vel fuscis; peritheciis minutis, sparsis, semi-innatis, atris, poro simplici pertusis; cirrhis albidis (?); sporidiis oblongis, rectis vel curvatis.—On living leaves of *Alnus glutinosa*. Shere, autumn, 1865 (Dr. E. Capron). Spots pallid, brown or tawny, rounded, about one-fourth of an inch in diameter. Perithecia minute, scattered over the spots, semi-innate, black, pierced at the apex. Sporidia oblong, straight or curved. (Fig. 23, sporidia, × 300.)

Cheilaria, *Libert.* Perithecia subglobose, dehiscing with a fissure. Nucleus gelatinous. Sporidia more or less globose, ejected in tendrils.

59. Cheilaria Coryli, *Rob.* Amphigenous. Spots irregular, rufous. Perithecia hypo- rarely epiphyllous, innate, membranaceous, subgregarious, very small, roundish, pallid brown, dehiscing with a longitudinal fissure. Nucleus white. Sporidia hyaline, oblong, somewhat truncate, wedge-shaped or fiddle-shaped.—Desmz. Ann. des Sc. Nat. 1853, xx. p. 226; Pl. Crypt. Exs. ed. ii. n. 80.—On leaves of *Corylus Avellana*. Darenth, Swanscombe, and Highgate, autumn, 1865.

60. Cheilaria Arbuti, *Desmz.* Epiphyllous. Spots minute, dark coloured. Perithecia minute, crowded, black, shining, roundish-

oblong, dehiscing by a longitudinal fissure. Nucleus at first whitish, ultimately blackened. Sporidia ovoid, minute, with two nucleoli.—Ann. des Sc. Nat. 1846, vi. p. 68. *Dothidea Arbuti*, Spr. ex Duby, Bot. Gall. ii. p. 717.—On leaves of *Arbutus Unedo*. Swanscombe, January, 1866.

PHYLLOSTICTA, *Pers.* Perithecia few and minute, innate, pierced with a terminal pore, seated on discoloured spots. Nucleus gelatinous. Sporidia ovoid or oblong, straight, minute, ejected in tendrils.

61. PHYLLOSTICTA ATRIPLICIS, *Desmz.* Amphigenous. Spots orbicular, whitish, with a tawny or brownish margin, scattered or confluent. Perithecia on the upper surface, very minute, numerous, globose, innate, brownish-black, pierced at the apex. Tendrils yellowish-white. Sporidia cylindrical, obtuse, straight or curved and somewhat torulose, with from 3 to 5 nucleoli.—Ann. des Sc. Nat. 1851, xvi. p. 298. *Sphæria (Depazea) vagans, atriplicicola*, Fr. S. M. ii. p. 582. —On leaves of *Atriplex* and *Chenopodium*. Highgate, 1864. (Fig. 22, sporidia, × 300.)

62. PHYLLOSTICTA CIRSII, *Desmz.* Epiphyllous. Spots roundish or irregular, numerous, whitish with a brown margin. Perithecia innate, black. Sporidia very minute, oblong, with two nucleoli.—Ann. des Sc. Nat. 1847, viii. p. 31.—On leaves of *Cirsium arvense*. Bungay, September, 1865.

63. PHYLLOSTICTA VICIÆ. Epiphyllous. Spots white, rounded, with a purplish margin. Perithecia minute, aggregate, black, with a terminal pore. Tendrils white. Sporidia ellipsoid with two, sometimes three, nucleoli.—*Ascochyta Viciæ*, Libert, Exs. n. 356. *Phyllosticta Ervi?* West. Bullet. des Brux.—On leaves of *Vicia sepium*. Sydenham, October, 1864.

64. PHYLLOSTICTA RUSCICOLA, *DR. and Mont.* Amphigenous. Spots pallid, with a reddish-brown margin. Perithecia scattered over the spots, covered by the epidermis, globose, black. Sporidia oblong. —Fl. Alg. i. p. 611; Mont. Syll. p. 279; Desmz. Ann. des Sc. Nat. 1847, viii. p. 32; Pl. Crypt. n. 1634; West. Bull. de Brux. vii. p. 23. —On the phyllodia of *Ruscus aculeatus*. Swanscombe, Kent, autumn, 1865.

65. PHYLLOSTICTA CYTISI, *Desmz.* Spots few, round or irregular, grey, with a brown margin. Perithecia epiphyllous, black, numerous. Sporidia ovoid-oblong, with two nucleoli.—Ann. des Sc. Nat. 1847,

viii. p. 34; Pl. Crypt. n. 1861.—On fading leaves of *Cytisus Laburnum*. Highgate, autumn, 1865.

66. PHYLLOSTICTA SAMBUCI, *Desmz.* Epiphyllous. Spots whitish, solitary or confluent, and disposed in a line. Perithecia innate, minute, few, brownish-black, pierced with a terminal pore. Nucleus whitish. Sporidia ovoid-oblong, with two nucleoli.—Ann. des Sc. Nat. 1847, viii. p. 34; Pl. Crypt. n. 1638.—On fading leaves of Elder. Shere, autumn, 1865 (Dr. E. Capron). (Fig. 28, sporidia, × 300.)

67. PHYLLOSTICTA PRIMULÆCOLA, *Desmz.* Spots occupying both surfaces of the leaves, large, blanched, oftentimes with a yellowish border. Perithecia epiphyllous, numerous, rather prominent, globose, black, shining. Sporidia subglobose, very small.—Ann. des Sc. Nat. 1847, viii. p. 130; Pl. Crypt. Fr. Exs. n. 1629.—On fading leaves of *Primula vulgaris*. Common, autumn.

68. PHYLLOSTICTA LIMBALIS, *Pers.* Spots ivory-white, with a discoloured margin, generally at the edges of the leaves. Perithecia rare, blackish, scattered, sometimes confluent. Sporidia oblong, hyaline, with three or four nucleoli.—Pers. Champ. Comest. *Depazea buxicola*, Fr. S. M. ii. 528; Fuckel, Fung. Rhen. n. 429. *Dothidea depazeoides*, Desmz. Ann. Sc. Nat. 1838. x. 311. *Septoria Elæagni*, Desmz. Ann. Sc. Nat. 1842, xvii. 107. *Sphæria lichenoides*, var. *buxicola* (De Cand.), Welw. Crypt. Lusit. n. 21.—On living Box leaves. Shere, autumn, 1865 (Dr. E. Capron).

69. PHYLLOSTICTA ERYSIMI, *West.* Spots blanched, rounded, with a linear dark brown margin. Perithecia numerous, black, scattered about the centre of the spot. Ostiole poriform. Sporidia oval, hyaline, containing two nucleoli at the extremities.—West. Bull. de Brux. 1863, n. 21.—On leaves of *Erysimum Alliaria*. Shere, autumn, 1865 (Dr. E. Capron).

DEMATIEI.

70. MACROSPORIUM HETERONEMUM, *Desmz.* Amphigenous. Spots scattered, tawny, irregular, sometimes confluent. Flocci erect, septate, of two forms, distinctly united in small fascicles, one kind conidiiferous, short, nodulose, tawny; the other kind simple, elongated, subflexuose, hyaline, obtuse above and attenuated below. Sporidia large, pedicellate, oblong-clavate, tawny, with the endochrome divided trans-

versely, and here and there longitudinally, into numerous cells; pedicels hyaline.—Ann. des Sc. Nat. 1853, xx. p. 216; Pl. Crypt. Exs. ed. ii. n. 7.—On fading leaves of *Sagittaria sagittifolia*. Irstead, Norfolk, September, 1865.—The specimens also contained, intermixed with the *Macrosporium*, the *Uredo*-spores described by Westendorp under the name of *Uredo Sagittariæ*, and as numerously as on specimens received from him. I also found the *Macrosporium* on Westendorp's specimens, and both *Uredo* and *Macrosporium* on Fuckel's specimen of *Phyllosticta Sagittariæ*. There were also one or two *Uredo*-spores scattered amongst the *Macrosporium* on Desmazières' specimen. A single leaf, collected by Mr. D. Stock, at Bungay, twenty years ago, but which had never been named, contained the *Macrosporium* and a few *Uredo*-spores. The latter are evidently those of a *Trichobasis*, and probably belong to *Puccinia Sagittariæ*, Rabh., a species not yet ascertained to be British.

EXPLANATION OF PLATE XLV.—1. *Valsa ceratophora*: *a*, section of group of perithecia, × slightly; *b*, ascus and sporidia; *c*, free sporidia, × 300. 2. *Diatrypella quercina*: ascus and sporidia, × 300. 3. *Podosphæra Kunzei*: tip of appendage, × slightly. 4. *P. clandestina*: tip of appendage, × slightly. 5. *Microsphæria comata*: tip of appendage, × slightly. 6. *Sphæria abbreviata*: asci and sporidia, × 300. 7. *S. diplospora*: sporidia, × 300. 8. *Valsa thelebola*: ascus and sporidia, × 300. 9. *Massaria eburnea*: sporidia, × 300. 10. *Sphæria epidermidis*: tetrasporous asci, × 300. 11. *Sphærella isariphora*: ascus and sporidia, × 300. 12. *Sphæria Araucariæ*: asci and sporidia, × 300. 13. *Phoma petiolorum*: sporidia, × 300. 14. *P. glandicola*: sporidia, × 300. 15. *Hendersonia sarmentorum*: sporidia, × 300. 16. *H. Corni*: sporidia, × 300. 17. *H. Robiniæ*: sporidia, × 300. 18. *Sphæria (Gnomonia) petioli*: ascus and sporidia, × 300. 19. *S. Alliariæ*: ascus and sporidia, × 300. 20. *Valsa tetratrupha*, var. *simplex*: ascus and sporidia, × 300. 21. *V. amygdalina*: ascus and sporidia, × 300. 22. *Phyllosticta Atriplicis*: sporidia, × 300. 23. *Septoria alnicola*: sporidia, × 300. 24. *S. Unedinis*: sporidia, × 300. 25. *S. Sorbi*: sporidia, × 300. 26. *S. Ficariæ*: sporidia, × 300. 27. *S. pyricola*: sporidia, × 300. 28. *Phyllosticta Sambuci*: sporidia, × 300. 29. *Septoria Sedi*: sporidia, × 300. 30. *S. Scleranthi*: sporidia, × 300. 31. *S. Hydrocotyles*: sporidia, × 300. 32. *S. Ribis*: sporidia, × 300.

DESCRIPTION OF A NEW SPECIES OF POLYGALA FROM SOUTHERN CHINA.

BY H. F. HANCE, PH.D., ETC.

Polygala (Blepharidium) cyanolopha, n. sp.; caulibus herbaceis diffusis a basi ad apicem ramosis teretibus pubentibus, foliis confertis

tristichis carnosulis brevissime petiolatis ovalibus obtusis cum acumine opacis subtus paululum pallidioribus 3–7 lineas longis flavido-viridibus, racemis plerumque supra-axillaribus densissimis 12–20-floris folia æquantibus, pedunculo communi angulato, bracteolis minutis deciduis, floribus vix bilinealibus, alis glabris lanceolato-oblongis falcatis setaceo-acuminatis capsula bis longioribus flavo-viridibus lineis purpureo-brunneis percursis, carina cristata basi viridulo-alba apice cum crista clare et intense cærulea, capsula lineam tantum longa ovali-compressa æqualiter angustissime marginata leviter emarginata margine vix ciliata, seminibus oblongis nigrescentibus dense albo-pilosis, arilli trilobi semine triplo brevioris lobis æqualibus.

This pretty little plant was found by me in the beginning of October, 1865, growing, not very abundantly, on a grassy hill on Danes' Island, Whampoa, and was very conspicuous by its yellowish tint, its dense clusters of flowers with variegated wings, and particularly by the beautiful deep clear blue of the crest, resembling in colour *Anagallis cærulea*, or some Gentian; the foliage is not very dissimilar to that of the Algerian *P. oxycoccoides*, Desf. Amongst the Chinese species known to me, it comes nearest to *P. glomerata*, Lour., with living specimens of which I have compared it, but is readily distinguished by the stem branching all the way up, by the yellowish not bluish-green colour of its much smaller leaves, by the flowers being not half as large, arranged in longer and far denser clusters, with striped wings and a blue crest, whilst in the many specimens of *P. glomerata* I have seen, they have invariably been green-winged, and with a greenish-white keel; and by the elliptic, less emarginate, narrow-margined and obscurely-ciliated capsule, which is less in size than one of the cells of that of Loureiro's species, the fruit of which is besides broadly orbicular, its greatest diameter being transverse, not vertical. The nearest natural ally of my new plant is, however, evidently *P. telephioides*, Willd. (nec Boiss. et Balansa), but that has the stem branched only from or at most just above the collum, the branches flexuose and sharply-angled upwards; its leaves are oblong and narrowed at the base; its racemes few-flowered; the flowers still smaller and different in colour; its capsule broader, and seeds less densely silky. Both Mr. Bentham and Prof. Miquel suggest that *P. glomerata* may be a form of *P. arvensis*, Willd., which, however, appears distinct enough, and has a much narrower-margined capsule, that of true *P. glomerata*

having the margin very much wider at the rounded apical angles than below. If any Chinese species is to be reduced, it will probably be *P. elegans*, Wall., which is likely to prove a form of *P. Japonica*, Houtt. Of the latter plant I possess good specimens from two Japanese localities, from Formosa, and from Australia Felix (for I entirely agree with Dr. Mueller and Mr. Bentham in considering Mueller's former *P. veronicea* as not distinct; it is a stunted form, with smaller flowers, but otherwise quite like the Asiatic plant). There is little to distinguish the Chinese from the Japanese species, except that the former has usually rather acuter calyx-wings: in the lateral or terminal position of the racemes, and the number of flowers in each, I find no constant difference, and both plants are conspicuous for the gradually-diminished size of their leaves from above downwards. A few years back I received specimens from Foochow,—not, to my regret, now accessible for re-examination—which I was quite unable to refer to the one or the other species with any certainty. By *true P. glomerata* I mean the typical Chinese plant, which is by no means rare here and in Hongkong, though never, I believe, growing gregariously like *P. elegans*, but always found as isolated specimens. Dr. Thwaites has referred to *P. glomerata* two Ceylon plants (C. P. n. 592! and 1079!), the one his variety *a. pedunculosa*, the other *P. hirsutula* of Arnott. But, with all respect for my acute friend's opinion, it appears to me that the habit, weaker stems, scattered leaves, slender elongated peduncles, larger purplish flowers, and narrow-winged fruit of both these plants, whether distinct *inter se* or forms of one species, decidedly negative such a combination. The most discordant and confused views prevail amongst all writers as to the species of this genus. To prevent misapprehension as to my own moderate conservative opinions, I may state that I do not consider many of the European species proposed of late years, as, for instance, *P. Desangelisii*, Ten.!, and *P. Lebelii*, Bor.!, to have anything like a well-established claim to specific rank; and, moreover, I believe all the reputed modern species grouped round the old Linnæan *P. vulgaris* need a careful and prolonged comparative study before any decided opinion can be formed respecting them. But still there should be a method in inquiries, and to adopt the extreme views of some botanists is to my mind impossible. MM. Grenier and Godron, while admitting several of the most doubtful species split off from *P. vulgaris*, nevertheless combine such extremely dissimilar plants

(so at least they seem to me) as *P. rosea*, Desf., and *P. Preslii*, Spr. Certainly *P. rosea* is far more allied to *P. major*, Jacq., than to *P. Preslii*, if, at least, characters, habit, and aspect are to have any weight; and, if not, how are we to judge any species? In the 'Florula Adenensis,' Dr. T. Anderson writes, under the name of *P. triflora*, L., no less than twelve reputed species, on which combination Mr. Edgeworth remarks (Journ. Linn. Soc. vi. 199) :—"I have examined the original specimens in the Hermann herbarium in the British Museum, have carefully compared them with the numerous specimens in the Kew herbarium, and have satisfied myself that there are three or four distinct species." So far as I have been able to compare some of the Indian species mentioned by Dr. Anderson, with Kotschy's Nubian ones distributed by the Unio Itineraria, I must express my entire dissent from Dr. Anderson's views. The late Mr. Webb, too, (Fragm. Florulæ Æth.-Ægypt. 32), kept these latter plants distinct. Again, whilst Bunge (Reliq. Lehmannianæ, 45) asserts *P. Sibirica*, L., and *P. tenuifolia*, Willd., to be beyond all doubt distinct, both Ledebour and more recently Regel (Radde, Reis. in Ost-Sibirien, Botanische Abth. Bd. 1 Heft 2. p. 277) with equal confidence unite them.

VEGETATION OF THE GREAT AUSTRALIAN BIGHT.

The vegetation of the country around the Great Australian Bight is as yet so imperfectly known, that the limits to which the bulk of West Australian plant extends eastwards, and the line to which the inland flora from the Burdekin, Darling, and Murray Steppes advances to the west remain to be ascertained; and any, even the most trifling addition to our knowledge on this point cannot but be acceptable. Mr. E. A. Delisser, an explorer, who, on several occasions has faced the obstacles which the aridity of the Bight country opposes to the progress of "squatters," and who lately advanced from the head of the Great Bight in a north-west direction over level, not materially scrubby, but permanently waterless country, brought with him the following plants from the remotest parts reached by him, which show the vegetation to be that of the eastern colonies, and not that of West Australia:—

Salsola Australis, *R. Br.*
Threlkeldia diffusa, *R. Br.*
Kochia Brownii, *Ferd. Mueller.*
K. sedifolia, *Ferd. Mueller.*
Kochia sp.
Arthrocnemum Arbuscula, *Moquin.*
Atriplex, allied to A. reniformis, *R. Br.*
Rhagodia sp.
Eremophila Latrobei, *Ferd. Mueller.*
E. Brownii, *Ferd. Mueller.*
E. alternifolia, *R. Br.* Var. latior.
E. scoparia, *Ferd. Mueller.*
E. Delisserii, *Ferd. Mueller.*
Grevillea, a species with long and narrow pinnatisected leaves; the flowers and fruits not collected.
Cassia artemisioides, *Gaudichaud.*
Templetonia retusa, *R. Br.*
Helichrysum Sonderi, *F. M.* (Ixiolæna tomentosa, *Sond.* and *Muell.*)
Comesperma volubilis, *Labill.*
Erodium cygnosum, *Nees.*
Zygophyllum Billardierii, *DC.*
Nitraria Schoberi, *L.*
Frankenia lævis, *L.*
Sida corrugata, *Lindley.*
Lavatera plebeja, *R. Brown.*
Pittosporum phillyroides, *DC.*
Cephalipterum Drummondi, *A. Gray.*

It will be observed that the last-mentioned plant is the only one which belongs to the West Australian flora exclusively, while all the others are either forms of the East Australian, or such as are common to both sides of the continent. *Eremophila Delisserii* is the only new plant of the collection. It is a well-marked species of a genus of which now about forty species are described; and partakes of several characters of the section *Pholidia*; the leaves are opposite and roundish.

FERD. MUELLER.

FLORA OF GLOUCESTERSHIRE.

NEW GLOUCESTERSHIRE PLANTS, COLLECTED BY ST. BRODY, PH.D., F.L.S. ETC.

Specimens of plants mentioned in the following list, have been seen by Mr. J. G. Baker. It is supplementary to a list published in last year's Report of the Thirsk Botanical Club (*vide* 'Journal of Botany,' Vol. III. p. 121.) None of the species are given by Mr. Watson for the South Severn sub-province.

Papaver somniferum, L.—In fields and waste ground near Upton.
Fumaria confusa, Jord.—On the borders of fields near Gloucester.
Lepidium latifolium, L.—Sandy fields near Garden Cliff.
Alyssum calycinum, L.—In fields near Dursley.
Cardamine sylvatica, Link.—On banks, Newent Canal.
Arenaria tenuifolia, L.—In fields, Stinchcombe Hill.
Linum usitatissimum, L.—In fields near Gloucester.
Tilia parvifolia, Ehrh.—Lancaut Cliffs.
T. intermedia, De Cand.—Longhope Wood.

Rosa sarmentacea, Woods.—In hedges near Birdlip.
R. dumetorum, Woods.—In hedges near Dursley.
R. glaucophylla, Bak.—In hedges near Cleeve.
R. verticillacantha, Bak.—In hedges near Gloucester.
Epilobium rivulare, Wahl.—On banks of the Severn, Gloucester.
Galium erectum, Huds.—On Stinchcombe Hill.
Tragopogon minor, Fr.—On the borders of fields near Upton.
Centaurea solstitialis, L.—In fields near Gloucester.
Monotropa multiflora, De Cand.—In Frith Wood.
Cuscuta Trifolii, Bab.—In clover fields near Painswick.
Rhinanthus major, Angl.—On the borders of fields near Stroud.
Thymus Chamædrys, Fr.—On Mitcheldean Heath. Very fine.
Calamintha officinalis, Angl.—On banks near Highnam.
Ballota ruderalis, Fr.—On rocks near Beachley.
Melissa officinalis, L.—Waste ground near Beachley.
Chenopodium olidum, Curt.—In waste ground near Gloucester.
C. polyspermum, L.—In waste ground near Hempstead.
C. rubrum, L.—In waste ground near Gloucester.
C. ficifolium, Sm.—On heaps of rubbish near Gloucester.
Polygonum mite, Schrank.—On banks near Tewkesbury.
Betula glutinosa, Wallr.—Hill Wood, near Mitcheldean.
Salix pentandra, L.—In a lane near Tewkesbury. Apparently planted.
S. Helix, L.—In a lane near Tewkesbury. Apparently planted.
S. rugosa, Sm.—In hedges near the Mitcheldean Station.
S. acuminata, Sm.—On banks of the Severn near Gloucester.
Allium compactum, Thuill.—On rocks near Beachley.
Anacharis Alsinastrum, Bab.—In all the canals around Gloucester.
Sparganium minimum, Fr.—In canals near Gloucester.
Juncus cœnosus, Jacq.—In marshy grounds near Beachley.
Luzula multiflora, Lej.—Heath, Mitcheldean.
L. congesta, Sm.—Heath, Mitcheldean.
Panicum Crus-galli, L.—On the borders of fields near Gloucester.
Setaria viridis, Beauv.—On heaps of rubbish near Quedgeley.
S. verticillata, Beauv.—Borders of fields near Hempstead.
Melica nutans, L.—Lancaut Cliffs.
Briza minor, L.—Lancaut Cliffs.
Brachypodium pinnatum, Beauv.—Dursley Hill.
Poa subcærulea, Sm.—On the borders of fields near Gloucester.
Glyceria maritima, M. and K.—Sandy shore near Beachley.
G. distans, Wahl.—Sandy shore near Beachley.
Triticum pungens, Wahl.—Sandy shore near Beachley.

INTRODUCED PLANTS.

Saponaria Vaccaria, L.—On heaps of rubbish near Gloucester.
Potentilla recta, L.—In waste ground near Quedgeley.

Linaria purpurea, L.—On old walls near Coleford.
Salsola Tragus, L.—In waste ground near Berkeley canal.
Malva parviflora, L., or *M. borealis*, Wallm., Syme's Eng. Bot. ii. p. 169.—In waste ground and meadow land near Gloucester.
Phalaris minor, Retz.—On heaps of rubbish near Berkeley canal.
Panicum miliaceum, L.—In waste ground near Gloucester.

WELWITSCHII ITER ANGOLENSE.

CORRIGENDUM.

From the absence of Dr. Welwitsch in Paris while the sheet describing his new *Bignoniaceæ* was passing through the press, the name FERNANDOA was misprinted *Ferdinandia* (Vol. III. p. 330).

CORRESPONDENCE.

Leucojum vernum, *Linn.*

J. C. Mansel, Esq., of Longthorns, writes that he has visited Bridport, and is able to confirm Mr. Hardy's suggestion as to *Leucojum vernum* being probably a British plant (*ante*, p. 88). He found it growing in abundance for a distance of more than a quarter of a mile on the banks and sides of a thick hedgerow in a remote valley, in which there are no houses. Mr. Mansel having been good enough to forward fresh specimens, we shall in an early number give a figure of the plant, and we reserve till then the further particulars which Mr. Mansel has communicated.

Fagus Forest in New England, Australia.

Mr. Charles Moore, the able Director of the Botanic Garden of Sydney, returning from a botanical excursion through the dense forests of the highlands of New England, discloses, for the first time, the existence of an extensive Fagus forest in that part of Australia. It covers the elevated ranges between the rivers Bellingen and Clarence, in belts from two to three miles in length. The *Fagus* is allied to *F. Cunninghami*, but the leaves are remarkably acute, their teeth smaller and more numerous; moreover the leaves attain a larger size, being not rarely 2 inches long, and measuring, in young plants, fully 4 inches in length. The subalpine nature of this Fagus country, which, in continental Australia, readily reminds of the Baw Baw ranges, is indicated by the presence of *Gualtheria hispida*. Several interesting and rare trees accompany the Fagus, for instance, *Elæocarpus holopetalus*, *Geissois rubifolia*, *Cuttsia viburnea*, *Croton Verreauxii*, a new *Lomatia* (*L. lasiantha*, F. M.), etc. The new Beech is to be described as *Fagus Moorei*, in the thirty-sixth number of the 'Fragmenta Phytographiæ Australiæ.'

FERD. MUELLER.

Melbourne Botanic Gardens, Dec. 26, 1865.

NEW PUBLICATIONS.

The Miscellaneous Botanical Works of Robert Brown, Esq., D.C.L., F.R.S. Edited by John J. Bennett, F.R.S., etc. Vol. I. Ray Society, 1866.

It is now more than forty years since Nees von Esenbeck published the first volume of his German edition of the collected works of Robert Brown, and this remains till now the only attempt to bring these wonderful memoirs into a compact and consultable form. Even the English student has been compelled to consult them in their German dress, for the possession of them in English necessitated the acquisition of volumes of voyages, travels, transactions, and journals, octavo, quarto, and folio, which of themselves would form a considerable library. It is surprising that an edition in the language in which they were originally published has been so long a desideratum. The Ray Society have conferred a great boon on science in supplying this desideratum, and this boon is greatly enhanced by their having obtained the help of Mr. Bennett, so long the intimate friend and colleague of Robert Brown, as editor.

This first volume contains two of the three divisions into which the editor has arranged the memoirs, viz. the geographico-botanical and the structural and physiological. The systematic memoirs and miscellaneous descriptions of plants are reserved for a second volume, and the illustrative plates will be published separately in a large quarto atlas. The papers are reprinted from the originals without change, in accordance with the express desire of their distinguished author.

The geographico-botanical memoirs consist of the appendices published with the narratives of the expeditions of Flinders and of Sturt to Australia, of Salt to Abyssinia, of Tuckey and of Oudney, Denham and Clapperton to Africa, and of Ross, Scoresby, and Parry to the Arctic regions, and of the memoir on the botany of Swan River. The systematic and physiological memoirs contain the papers on the Parts of Fructification in Mosses, on Remarkable Deviations from the usual Structure of Seeds and Fruits, on *Rafflesia* and *Hydnora*, on *Kingia*, on Active Molecules, on the Organs and Mode of Fecundation in *Orchideæ* and *Asclepiadeæ*, on the Relative Position of the Divisions of Stigma and Parietal Placentæ in the compound Ovarium, on the Plurality and Development of the Embryos in the seeds of *Coniferæ*, on the Gulf Weed, and on *Triplosporite*.

Della Distribuzione Geografica dei Licheni di Lombardia e di un nuovo ordinamento del genere Verrucaria. Dal Dr. Santo Garovaglio, Prof. di Botanica nella R. Univ. di Pavia, etc. Pavia: 1864. 8vo. pp. 34.

Sui più recenti Sistemi Lichenologici e sulla importanza comparativa dei caratteri adoperati in esse per la limitazione dei generi e delle specie. Dal Dr. S. Garovaglio. Pavia: 1865. 8vo, pp. 34.

Sugli Organi riproduttori del genere Verrucaria. Nota del Dottor Giuseppe Gibelli, Prof. di Storia Nat. nel R. Liceo di Pavia. Milano: 1865. 4to, pp. 14. Plate.

Tentamen Dispositionis Methodicæ Lichenum in Longobardia nascentium, auctore Sancto Garovaglio. Mediolani: 1865. 4to, pp. 88. 5 plates.

These four works all relate to the same subject. In the first of them, Professor Garovaglio announces his intention to publish a series of memoirs, in which he would describe accurately the several species of Lichens growing in Lombardy, illustrated with microscopical details of their minute internal organization. The materials for this, he has collected during the past thirty years, having journeyed through every part of this singularly favoured province of Italy, which, from various concurring causes, furnishes a greater variety of Lichens than any similar country of Europe. This he ascribes to the gradual elevation of Lombardy from the lower region of the Olive and Laurel to the limits of eternal snow, affording in a circumscribed space under the same parallel of latitude, a regular succession of zones, similar to those found in passing from the tropics to the polar circles, together with the notable difference of temperature, which the varied course of the iso thermal line makes from place to place, according to this elevation.

He then enters into a detail of the principal geographical and geological features of the district, enumerates some of the rarer Lichens which he has collected on the several geological formations, and details the many new Lichens which his own researches have added to the general store, several of which have been named after him.

In the second work, the Professor passes in review the various systems which have found favour among different schools of lichenists in modern times; and states those principles by which he himself purposes to be guided, and which he enlarges upon more fully in the Prolegomena to his 'Tentamen.'

In the third work, Professor Gibelli narrates the result of a very ex-

tensive examination, conducted with great care and accuracy, into the organization of the reproductive apparatus of the *Verrucariæ*. The conclusion to which that research has conducted, is this :—That the spermatigerous apparatus or the supposed male organs, are contained either in separate conceptacles, termed *spermogonia*, or are enclosed in the apothecium, together with the asci and spores, when they are termed *spermatocalia*. That when the species possess spermogonia, then the apothecium contains paraphyses distinctly visible, together with the asci and the enclosed spores, and may be termed *diclinous*. But that when the apothecium is destitute of distinct paraphyses, the spermatigerous apparatus or spermatocalia hangs like a fringe from the upper portion of the interior of the apothecium over the asci and spores, which occupy the lower portion of the interior, and may be termed *hermaphrodite ;* and that all the saxicolar species, whether with unilocular, bilocular, quadrilocular, and multilocular or muriform spores, are destitute of distinct paraphyses, and consequently hermaphrodite : whilst the corticolar species possess paraphyses, and are all diclinous.

This interesting and ingenious discovery, Professor Garovaglio has made the basis of his arrangement of the *Verrucariæ*, in his 'Tentamen.' He has taken a *media via* in his system, avoiding on the one hand the innumerable genera of the Massalongian school, and, on the other, not implicitly following the comprehensive or aggregate one, of which the celebrated Dr. Wm. Nylander is the acknowledged *princeps*. He excludes from his genus *Verrucaria*, all those species having a foliaceous or squamose thallus, such as *Sagedia*, Fries, *Endocarpon*, Ach., etc., and limits it to those species which possess a crustaceous thallus. Thus limited, his genus comprehends no less than thirty-five genera, and more than two hundred species of the Massalongian lichenists.

His own words will best explain the principles of his labours :—

1. In *Verrucariæ* genere omnes comprehendi lichenes angiocarpos nucleo simplici et homogeneo, epithecio plerumque ad instar carbonis nigricante, præterea thallo crustoso instructos.

2. Maximi habito loculorum numero, unde spora constat, in quatuor potissimas *sectiones* genus omne partitus sum, videlicet, uniloculares, biloculares, quadriloculares cum quatuor ad octo loculos, una serie ad lineam superimpositis, denique pluriloculares tessellatas cum loculis collateralibus conglomeratisque.

3. Præsentia paraphysium defectiove, masculorum organorum con-

ditio quoad situm quem tenent; ascorum figura, modo itidem considerato, quo in ipsis distributæ sporæ consistunt; interdumque etiam thalli variatio, apotheciorum situs, et sporarum magnitudo mihi normam præbuerunt, qua species ejusdem sectionis in secundos ordines, quos *cohortes* appello, disponerem.

4. Demum multiplicibus aliis modis, quos organa tum interiora tum extima offerunt, simul assumptis varieque collatis caute uti ac sobrie studui, quo *speciebus* diversis fines constituerem, ut pro re licuit, distinctissimos.

Each species is headed with a short diagnosis, followed by a full and lengthened detailed description of every part, a most ample synonymy, and references to all published collections of *Lichenes Exsiccati*, with valuable *adnotationes*, elucidating difficulties or contrasting affinities and diversities.

Only the unilocular and bilocular species are as yet published, and the entire work is to be illustrated with actual specimens.

Verba Nominalia; or, Words derived from Proper Names. By R. S. Charnock, Ph.D., etc. London. 1866. Pp. 357.

The number of words in every-day use derived from proper names is very great; and from the way they have been altered through ignorance, carelessness, or the "genius" of the language, it is often puzzling to trace them to their origin. On what principle did the Italian name of the Sun-flower, Girasole, become converted into Jerusalem, as a designation for an Artichoke? How did Quince come from Cydonia, Humbug from Hamburg, and Dimity from Damietta? Such curious derivations, and the history of them, supply Dr. Charnock with the materials for an interesting and useful volume, abounding with information which general readers are often puzzled where to find. It would be impossible to make it at once interesting to the public and valuable to those engaged in special studies. In botany, for instance, the number of generic designations derived from proper names is very great; and since Boehmer's dissertation was published, no special work has been devoted to them. The names met with in popular books can only be expected in Dr. Charnock's volume; but even in regard to them the author would do well, when a second edition is required, to obtain for his sheets the revision of a botanist, as the classification and the information given are often very antiquated.

BOTANICAL NEWS.

Dr. Seemann has been obliged to resign the office of Secretary to the International Botanical Congress, to carry out some explorations in New Segovia and other little-known parts of Central America. He left Southampton on the 2nd of March, and proceeds by way of St. Thomas and Panamá to Realejo, on the Pacific, where he will disembark. Dr. Seemann has arranged that during his absence the 'Journal of Botany' will be edited by Mr. Carruthers, of the botanical department of the British Museum. Communications should, however, be addressed as before, "To the Editor of the Journal of Botany."

The fourth part of Seemann's 'Flora of Viti,' containing the *Rubiaceæ* and *Compositæ*, has been published.

The University of Cambridge has purchased the herbarium of the late Professor Lindley (except the *Orchideæ*, which were some time ago purchased for the Kew herbarium), for the sum of £300.

The acting committee of the Botanical Congress, to be held in May next, in connection with the International Horticultural Exhibition, consisting of a number of eminent botanists in London and the provinces, are successfully carrying out the arrangements for the meeting, which promises to be a large and important one. By permission of the Lords of the Committee of Council on Education, they have obtained the use of the Raphael cartoon room of the Kensington Museum for the meetings of the Congress. A number of distinguished foreign botanists have already notified their intention to be present, and papers have been announced from J. E. Howard, F. Mueller, Morren, Lecoq, Seemann, Masters, Van Hulle, Schultz-Bipontinus, and others. There will be two meetings of the Congress; at the first, on May 23rd, Professor De Candolle will deliver his inaugural address, copies of which will be circulated at the meeting in the English, French, and German languages. The second meeting will be held on the following day. Besides the grand banquet at the Guildhall on May 22nd, there will be two *conversazioni*, one on the evening of May 23rd, the other on May 25th. Botanists intending to take part in the Congress should communicate with Dr. Maxwell Masters, the honorary secretary, at the office of the exhibition, 1, William Street, Lowndes Square, London, S.W.

The third volume of the 'Selecta Fungorum Carpologia' of the Messrs. Tulasne, completing the work, has just been published. It concludes the account of the *Sphæriacei*, to which the second volume was entirely devoted, containing the section *Nectriei*, which occupies the bulk of the volume, the remaining space being given to selections from the *Helvellacei* and the *Phacidei*. The four volumes which these authors have now published, the 'Fungi Hypogæi,' and the present work, embrace all the *Ascomycetous* fungi, of which, however, they have only included, in the majority of cases, selected examples.

A new weekly periodical, entitled 'Scientific Opinion,' is announced for April 4th. It will consist of extracts from British and foreign journals and transactions of societies, of important discoveries, and observations in the different departments of science.

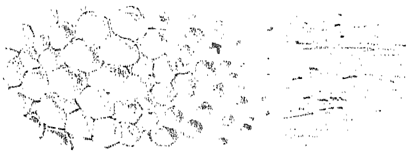
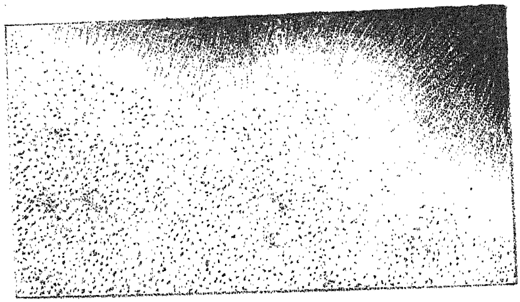


Fig. 2.



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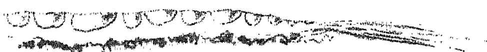

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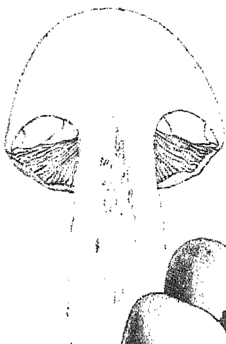

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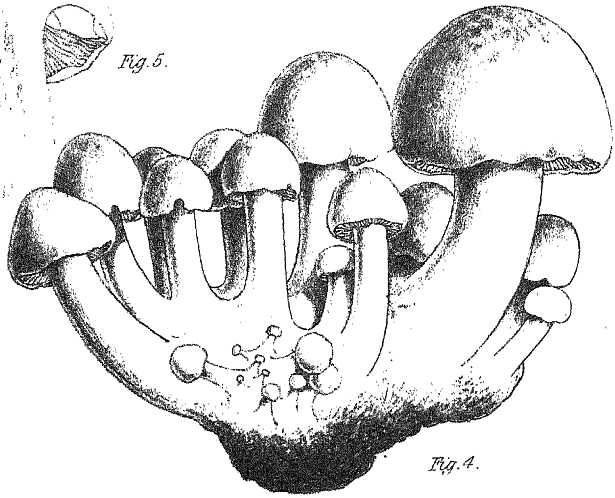


Fig. 4.

W G Smith, del. et lith.

Vincent, Brooks, Imp.

ON SOME OF THE LARGER AND RARER FUNGI OBSERVED DURING 1865.

By W. G. Smith, Esq.

(Plate XLVI.)

As a rule, the larger fungi are so fugitive in their nature, so capricious in their appearance, and so changeable as to their localities, that it is always difficult to assign either time or place for their appearance. Certain species, for instance, that are considered peculiar to a special habitat may occasionally be found in abundance in quite a different locality, and certain situations such as fir plantations, may often be searched for in vain from year's end to year's end without one species peculiar to fir districts being seen. Again, other species, such as *Agaricus (Pleurotus) ostreatus*, usually found growing in the autumn or early winter, will appear in the greatest abundance in spring, and it certainly has been our experience more than once, whilst searching for fungi peculiar to the south, to find in plenty a batch supposed never to be seen out of the north, and what is not dissimilar, to find a northern species luxuriating in a hot greenhouse, whilst the same plant is dwarfed and abortive in the exposed air outside. The mycologist can never make sure of finding any particular species, for where a certain group has been found plentifully during one year a single specimen may be looked for in vain for many years afterwards; it has probably been the experience of every one who has studied the subject, to have found *once* a single specimen of a rare, or perhaps common species, and never to have found it again, and after devoting several years nearly exclusively to this subject, it has certainly been our lot *never to have seen* one or two common species that are said to be "extremely common" and "most abundant;" some of these common forms appear rarely or never near London, whilst some of the rarer may be found before the smoke of London has been left behind. With some species it is difficult to say which are rare and which common, for the plant that is rare here may be common there, and the rarity of one season may be the "drug" of the next.

That the above statements, however, are not entirely without exceptions, is proved by the occurrence of *Boletus castaneus* for many years

in succession in exactly the same place in a meadow near London, and we have remarked *Helvella crispa* in a lane near Dunstable, appearing in the early autumn of every year; with the greatest regularity it steadily advances up the lane, further and further each year, after the manner of *Marasmius oreades* and other fungi, the mycelium evidently exhausting the soil annually; it grows in a manner analogous to the fairy-rings of our downs and meadows.

During the past year, we have paid more than usual attention to the larger fungi, their occurrence, their habitats, and their seasons, and with the assistance of at least two very kind friends interested in these plants, Mrs. Gulson, of Eastcliff, near Teignmouth, Devon, and Miss Lott, of Barton Hall, Kingskerswell, near Newton Abbot, also in Devon, we are enabled to give a very interesting list of the principal species gathered and noted during 1865. Without doubt the plant that should take the first place in this list is *Agaricus (Tricholoma) albellus*, a single specimen only of which we found at the base of a Beech-tree in an avenue of old Beeches in Thorsby Park, near Ollerton, Notts, in the beginning of September. This is the first and only record of its appearance in this country since the time of Sowerby, who considered it rare, and only found it twice, it is figured in one of his volumes devoted to British fungi, plate cxxii. In Mr. Cooke's 'Index Fungorum Britannicorum,' it is given as a doubtful or *extinct* species. Its general appearance would certainly warrant one in first imagining it to be merely an abnormal growth of some other plant belonging to the group *Tricholoma*. Our specimen, given in Plate XLVI., Fig. 4, appears to be altogether more robust and characteristic than Sowerby's, and parts indefinite or indicated only in the latter, are in this specimen fully and boldly brought out. In addition to the description given by the Rev. M. J. Berkeley, in his 'Outlines of British Fungology,' we may say the stem in the fresh plant has a slight inclination to be silky outside, becoming ultimately stuffed or inclined to hollow, whilst the word "mottled" would give a better idea of the pileus than "spotted after the fashion of scales;" this part of the plant, as may be seen in Fig. 5, is very conical and fleshy.

The most interesting plant after *Agaricus albellus* is *Boletus cyanescens*, a *single* specimen of which was found by Miss Lott, at Kingskerswell, in the middle of September; this solitary specimen agreed in the most minute particulars with the plants found by Mr. Cooke in

September, 1864, at Neatishead, in Norfolk, and figured in 'Journal of Botany,' Vol. III. Plate XXX. The single specimen from Devon, on being broken, besides displaying the brilliant cobalt colour, showed three or four small crimson spots in the fractured parts. In outward appearance this species somewhat resembles *B. elephantinus*, but on close examination differs in every particular. The latter may be *immediately* distinguished by its elaborately reticulated stem, whilst the stem of *B. cyanescens* has not the slightest trace of any network. On the last annual excursion of the Society of Amateur Botanists, we found *B. elephantinus* in great abundance on Banstead Downs, Surrey, always in company with *B. luridus;* here we also gathered a single specimen of *B. Satanas,* and a most magnificent single specimen of this species we found in Crab-tree Wood, near Winchester. Mrs. Gulson also found two plants near Teignmouth. *B. æstivalis* appeared plentifully in one particular part of Bishop's Wood, near Hampstead, in the spring, it had not been noticed on any previous year, although the wood had been well searched; we found a single specimen of *B. alutarius* in the autumn in an open part of the same wood. *Agaricus (Collybia) tuberosus* also deserves mention here, as found sparingly in another part of the wood in the summer, with *A. squamosus* and *Lactarius acris,* a very handsome species, turning to a brilliant sienna red when bruised; it is said to be rare, we never observed it anywhere near town before. *Polyporus rutilans* we have twice found in this wood. Before leaving the account of this neighbourhood, the record of *Polyporus terrestris* must find a place; we give a drawing of it in Plate XLVI., Fig. 1, an enlarged drawing of the pores and the arachnoid edge is given in Fig 2, and a section in Fig. 3. This species may generally be found on the naked ground at the north-west of London, but generally in an abnormal or unsatisfactory condition; in the specimen figured, which grew partly under a plank, the pores were beautifully developed, the whole plant having a highly finished and perfected appearance. Fries has suggested that this species may only be an unnatural growth of another species, but its singularly perfect appearance when well grown, throws a serious doubt on the suggestion. Portions of this fungus grew rapidly, readily, and well on peat, under a propagating-glass. *Clavaria stricta* and *C. pistillaris* we have found in many different places; *Lentinus cochleatus* we found in Hampshire; the rare *L. vulpinus* was found in large masses

on an old stump, by Miss Lott, with *Auricularia lobata*, and Mrs. Gulson, at Teignmouth, found *A. mesenterica* in equal plenty, both ladies gathered very large specimens of *Agaricus (Clitocybe) giganteus*, and characteristic ones of *Boletus granulatus*. Of the beatiful *B. calopus* we found three or four specimens in the spring in Epping Forest. The following species were found by Miss Lott, and forwarded to us amongst a quantity of others of less interest:—*Agaricus (Pleurotus) subpalmatus*, on some squared planks; this is a most beautiful species, the top of pileus is honeycombed, mottled, and gelatinous, and closely resembles, in texture, the flesh of *Fistulina hepatica*, when cut, it is beautifully coloured, has a rather strong but not unpleasant odour, and throws down a profusion of white spores. *Polyporus cæsius*, with verdigris-coloured spores, and tubes shaded with blue, plentifully on Larch, a most beautiful and characteristic species. *Geaster fimbriatus*, *Peziza coccinea*, *Agaricus (Collybia) esculentus*, abundant in Fir plantations, amongst the dead leaves, deeply rooting. *A. (Tricholoma) terreus*, and *A. (Psalliota) cretaceus*, (both found plentifully by Mrs. Gulson); we also found the latter species in many different places during the year, and *A. (Lepiota) acutesquamosus*.

In the late autumn, we found the "early summer" species *A. (Amanita) vernus*; this is one of the most noble and beautiful, as well as poisonous of all the *Agaricini*. The list cannot be closed without a record of *Paxillus Pannoides*, found of enormous size and in large masses on rotten sawdust, by Mrs. Gulson, near Teignmouth.

EXPLANATION OF PLATE XLVI.

Fig. 1. *Polyporus terrestris*. 2. Ditto enlarged, showing arachnoid edge. 3. Section of ditto. 4. *Agaricus (Tricholoma) albellus*. 5. Section of ditto, natural size.

PIPERACEÆ NOVÆ.

Auctore CASIMIR DE CANDOLLE.

Genus I. PEPEROMIA, *R. et P.*

Sect. I. TILDENIA.—*Ovarium apice styliferum; bractea peltata.*

A. *Folia alterna.*

P. ovato-peltata; foliis longe petiolatis ovato-acuminatis ad $\frac{1}{3}$ alt.

peltatis glabris siccis pellucido-membranaceis pellucido-punctatis 7-9-nerviis, petiolis glabris canaliculatis, amentis longe pedunculatis, bractea ovato-acuminata peltata.—In Mexico (Herb. Pav. in Herb. Boiss.) et Costa Rica (Hoffmann, n. 521, Herb. Reg. Ber.).—Radix tuberosa, foliorum limbi 0,005 longi, petioli et pedunculi 0,1 circ. longi.

P. parvifolia; folio superiori longissime petiolato ovato-orbiculari sub medium peltato sicco subcucullato glabro coriaceo subtus juxta marginem lineato enervio, foliis inferioribus scariosis dense approximatis incompletis, amentis longè pedunculatis glabris, bractea rotundato-peltata, filamentis longis.—In Peruvia (Herb. Pav. in Herb. Boiss.) et Bolivia (Pentland, n. 12850, Herb. Kew.).—Planta cæspitosa, radix fibrosa, caulis subnullus, foliorum superiorum limbi 0,002, petioli 0,015 longi.

P. Sprucii; foliis ovatis vel ovato-rotundatis glabris petiolatis interdum basi subpeltatis subcordatisque apice obtusis siccis pellucido-membranaceis pellucido-punctatis 5-nerviis, bractea rotundato-peltata. —In Peruvia orientali prope Tarapoto (Spruce, n. 4981, Herb. Kew.). —Foliorum limbi 0,025-0,03 longi 0,025 lati.

P. muscophylla; foliis petiolatis ovato-rotundatis apice acutis basi rotundatis reniformibusve supra puberulis subtus hirsuto-puberulis siccis pellucido-membranaceis 5-7-nerviis.—In imper. Mexicano (Herb. Pav. in Herb. Boiss.).—Caulis brevissimus superne hirsuto-puberulus pellucidus 0,02 circ. altus, foliorum infer. limbi petiolique 0,006 longi.

B. *Folia opposita vel verticillata.*

P. diffusa; foliis breviter petiolatis plerumque quinis oblongo-obovatis apice obtusis basin versus subattenuatis acutiusculis utrinque glabris siccis rigidulis pellucidis 3-nerviis, bacca oblonga basi immersa apice mucronata.—In republica Venezuelania prope coloniam Tovar alt. 3000-4000 (Fendler, v. 1178, Herb. Cand.).—Fruticulus repens, ramuli sicci subtetragoni anguste subalati, foliorum limbi 0,015 longi 0,005 lati, petioli 0,002 longi.

P. Hoffmannii; foliis quaternis brevissime petiolatis e basi cuneata obovatis apice emarginulatis utrinque glabris siccis rigidulis subpellucidis uninerviis nervo centrali sæpe inconspicuo utrinque alternatim nervulos 1-2 patulo-adscendentes mittente, amentis terminalibus solitariis longiuscule pedunculatis pedunculo brevioribus densifloris, bacca ovato-oblonga apice in stylum longiuscule attenuata, stylo imo apice

stigmatifero.—In Costa Rica (Hoffmann, n. 415, Herb. Reg. Ber.).—Herba repens, caulis filiformis glaber, foliorum limbi 0,005 longi 0,004 lati.

Sect. II. MICROPIPER.—*Stylus nullus; ovarium apice imo vel oblique vel subantice vel antice stigmatiferum.*

A. *Folia alterna.*

1. *Ovarium apice imo stigmatiferum.*

a. Bacca pedicellata.

P. Fernandopoiana; foliis alternis petiolatis lanceolato-acuminatis utrinque glabris siccis membranaceis opacis 5-nerviis, amentis axillaribus terminalibusque solitariis, bacca breviter pedicellata, ovata pedicello immerso.—In Fernando Po (Mann, n. 394, Herb. Kew.).—Herba procumbens, foliorum limbi 0,05 longi 0,025 lati, petioli 0,01 longi.

a. foliis siccis subopacis. In sylvis editis densioribus insulæ St. Thomas ad Fazenda de Monte Catt. alt. 1800 pd. (Welwitsch, It. Angol. n. 507, Herb. Cand.), et rarius in rupestribus umbrosissimis ad Matis de Lungo præsidii Pungo alt. 1400–3500 pd. (Welwitsch, It. Angol. n. 505, Herb. Cand.).

b. Bacca sessilis.

α. Stigma discoideo-bilobulatum.

P. Fraseri; foliis longiuscule petiolatis alternis sparsis vel oppositis ternis quaternisve brevissime subpeltatis cordato-lanceolatis glabris 7–9-nerviis siccis membranaceis, amentis paniculato-confertis densifloris, ovario emerso apice stigma granuloso-puberulum orbiculare bicrenatum gerenti.—In Ecuador (Fraser, Herb. Cand. et Spruce, n. 5532, Herb. Cand.).—Herba erecta, foliorum limbi 0,05, petioli 0,045 longi.

β. Stigma simplex, penicillatum vel punctiforme.

P. Andinacea; foliis alternis petiolatis orbicularibus minutissimis supra setose pilosulis subtus glabris siccis pellucidis 3-nerviis petiolis glabris, amentis terminalibus densifloris, ovario semi-immerso.—In Andibus Quitensibus (Jameson, Herb. Kew.).—Herbula cæspitosa tenerrima, caulis tenuiter filiformis glaber, foliorum limbi 0,001, petioli 0,002 longi.

P. Bangroana; foliis alternis petiolatis orbicularibus utrinque pilosulis, margine ciliolatis siccis rigidulis aveniis, amentis terminalibus, ovario profunde immerso, bacca subglobosa.—In Africa tropicali ad

flumen Bangroo (Mann, n. 905, Herb. Kew.).—Herba repens, caulis filiformis subtiliter hirtellus, foliorum limbi 0,008, petioli 0,002 longi.

P. nana; foliis alternis petiolatis orbicularibus vel subreniformibus apice obtusis basi rotundatis truncatisve utrinque glabris siccis tenuissimis 3-nerviis, amentis oppositifoliis sublaxifloris, bacca ovato-acuta subimmersa.—In insula Mohely (Boiv. in Herb. Brit. Mus.).—Herba pellucida glabra 0,02 alta, foliorum limbi petiolique 0,003 longi.

P. Caledonica; foliis alternis petiolatis ellipticis utrinque pilosulo-pubescentibus siccis membranaceis subopacis trinerviis, amentis terminalibus filiformibus solitariis, folia paulo superantibus subdensifloris, bacca subglobosa brevissime mucronulata.—In Nova Caledonia (De la Planche in Herb. Cand.).—Herbula repens, caules piloso-pubescentes filiformes tenuissimos 0,002 circ. altos mittens, foliorum limbi 0,012 longi 0,07 lati, petioli 0,002 longi.

P. Mascharena; foliis alternis brevissime petiolatis rotundis utrinque et margine ciliolatis siccis tenuissimis pellucidis anerviis, amentis axillaribus terminalibusve densifloris brevissimis, bacca globosa basi immersa.—In insula Madagascar (Roxburgh in Herb. Brit. Mus.), et Vitenhage, in valle Olifantshoek inter ostia fluviorum Zoudagriri et Boshman (Zeyher in Herb. Francavil).—Herbula repens, caulis filiformis, foliorum limbi 0,005 longi, amenta 0,004 longa, pedunculi 0,007 longi.

P. Weddellii; foliis alternis longe petiolatis paulo supra basin peltatis ovatis apice breviter acuminatis acutis basi rotundatis utrinque glabris siccis membranaceis pellucidis 7–9-nerviis, amentis apice caulis oppositifoliis solitariis longe pedunculatis, ovario emerso.—In imper. Brasiliensi prope Rio Janeiro (Weddell, n. 762, in Herb. Cand. ex Herb. Mus. Par.).—Herba inter Muscos repens, caulis filiformis glaber 0,002 crassus apice suberectus, foliorum limbi 0,04 longi 0,035 lat., petioli 0,06 longi.

P. villosa; foliis alternis longiuscule petiolatis cordato-ovatis apice obtusis supra villosis subtus ad nervos villosis siccis membranaceo-pellucidis 7-nerviis, amentis axillaribus terminalibusque pedunculis villosis, ovariis subimmersis.—In sylvis Andium Quitensium alt. 9000 pd. (Jameson, n. 24).—Herba villosa basi procumbens radicans, foliorum limbi 0,035, petioli 0,03, amentorum pedunculi 0,035 longi.

P. Trianæ; foliis alternis petiolatis subelliptico-lanceolatis apice

acutis basi in petiolum subdecurrentibus utrinque glabris junioribus supra subtusque ad nervos parce pubescentibus siccis membranaceis subpellucidis septuplinerviis, amentis oppositifoliis solitariis folia æquantibus densifloris, rachi foveolata, ovario immerso obovato vertice complanato stigmatifero, bacca subglobosa.—In prov. Antioquien, Novæ-Granatæ, alt. 1500 (Triana, Exsicc. n. 65, Herb. Cand.).—Suffrutex ?, ramuli glabri sicci plicato-rugulosi nodosi, filiorum limbi 0,06 longi 0,027 lati, petioli 0,006 longi.

2. *Ovarium paullo antice stigmatiferum.*

a. Plantæ minimæ.

P. serpens; foliis brevissime petiolatis ovatis vel inferioribus ovato-rotundis utrinque obtusis utrinque hirsutis siccis rigidulis opacis, petiolo hirsuto, amentis terminalibus solitariis folia multoties superantibus filiformibus densifloris hirtellis, ovario immerso.—In Novæ-Granatæ prov. Barbacoas ad viam Tuquerras, alt. 6000 m. (Triana, Exsic. n. 58).—Herba repens, caulis filiformis sublignosus millim. crassus hirtellus sulcatus, foliorum limbi 0,003–0,005 longi 0,003–0,004 lati, petioli 0,001 longi.

P. lanceolato-peltata; foliis longe petiolatis ovato-lanceolatis basi paulo supra basin peltatis apice parum protractis acutis margine ciliolatis supra glabris subtus pilosis siccis membranaceo-pellucidis 7-nerviis, amentis solitariis filiformibus longe pedunculatis ciliolatis, ovario semi-immerso.—In Venezuela et Costa Rica (Hoffmann, n. 414, Herb. Reg. Ber.; Fendler, n. 1149, Herb. Cand.) et regione temperata prov. Caracassanæ (Moritz, n. 1979, Herb. Francav.).—Herba subacaulis et stolonifera, foliorum limbi 0,06, petioli 0,04, pedunculi 0,04 longi.

P. subpeltata; foliis longissime petiolatis rotundato-peltatis apice acutiusculis basi cordatis siccis membranaceis pellucidis utrinque glabris 5-nerviis, amentis axillaribus longe pedunculatis subremotifloris, pedunculis glabris.—In Pichincha (Jameson, n. 62 et 641, Herb. Kew. et 5857, Herb. Cand.).—Herba glabra, repens? vel scandens ?, caulis filiformis, foliorum maj. limbi 0,02, petioli 0,04–0,08, pedunculi 0,03–0,035 longi.

P. subrotundifolia; foliis petiolatis subreniformi-rotundatis inferioribus e basi subcordato-ovatis omnibus utrinque glabris siccis membranaceis pellucidis 3-nerviis, petiolo glabro, amentis axillaribus

terminalibusque filiformibus subdensifloris folia multoties superantibus breviter pedunculatis pedunculo glabro petiolum æquanti.—In Cuba (Wright, n. 2263, Herb. Cand.).—Herba basi radicans 0,01 circ. alta glabra, foliorum limbi 0,011 longi 0,013 lati, petioli 0,005 longi.

P. Jamesoniana; foliis petiolatis ovato-lanceolatis apice obtusiusculis plerumque emarginulatis glabris apice ciliolatis uninerviis siccis pellucido-membranaceis, petiolis glabris vel subtiliter puberulis, amentis terminalibus solitariis densifloris, ovariis emersis.—Ad basin Andium prope Punta Playa (Jameson, n. 743–744, Herb. Boiss.), et Venezuela (Moritz, n. 1940, Herb. Brit. Mus.).—Herbula super arborum truncos parasitica (Jameson, l. c.), caulis filiformis, foliorum limbi 0,01–0,015, petioli 0,001 longi.

b. Plantæ caulescentes, majores.

a. Folia peltata vel subpeltata.

P. Tarapotana; foliis alternis longissime petiolatis ovato-cordatis apice acuminatis basi cordatis peltatisque glabris siccis membranaceis pellucidis 10-nerviis, amentis axillaribus terminalibusque 3–5 approximatis, ovario emerso.—In Peruvia orientali prope Tarapoto (Spruce, n. 4570, Herb. Cand.).—Planta stolonifera, foliorum limbi 0,12, petioli 0,14 longi.

P. cordulata; foliis petiolatis ovato-rotundis vel ovato-acutis basi rotundato-cordulatis subpeltatis utrinque glabris membranaceis 11-nerviis, amento terminali densifloro, ovario emerso, bacca ovato-acuta.—In isthmo Panama (Fendler, n. 265, Herb. Kew.).—Caulis siccus complanatus glaber, foliorum limbi 0,07 longi 0,055 lati, petioli 0,01 longi.

β. Folia cordata et non peltata.

P. pseudo-dependens; foliis alternis longissime petiolatis brevissime subpeltatis rotundato-ovatis basi profunde rotundato-cordatis apice subattenuatis acutiusculis utrinque glabris siccis tenuissime membranaceis 10-nerviis, petiolo membranaceo, amentis axillaribus terminalibusque solitariis subremotifloris, ovario impresso, bacca subacuta basi subimmersa.—In Venezuela prope La Victoria, alt. 2100 (Fendler, n. 1817, Herb. Cand.).—Herba tenera sicca membranacea, foliorum limbi 0,11 longi, petioli 0,09 longi.

P. lignescens; foliis alternis longiuscule petiolatis oblongis apice acuminatis acutis basi rotundato-cordulatis supra glabris subtus ad

nervos subtiliter hirtellis siccis membranaceis subpellucidis noveno-nerviis, petiolo subtiliter hirtello glabratove, amentis axillaribus terminalibusque solitariis densifloris, ovario immerso.—In Costa Rica (Hoffmann, Herb. Reg. Ber.).—Planta scandens? e nodis inferior. radicans, epidermide sicca canescenti plicato-rugulosa, foliorum limbi 0,055 longi 0,02 lati, petioli 0,02 longi.

P. Miqueliana; foliis alternis sessilibus subsessilibusve ovatis basi rotundato-cordatis apice attenuatis obtusiusculis supra glabris subtus ad nervos præsertim pubescentibus 7-nerviis siccis membranaceo-rigidis opacis, amentis axillaribus terminalibusque solitariis subdensifloris, ovario immerso, bacca ovato-acuta brevissime mucronulata.—In Andibus Quitensibus (Jameson, n. 737, Herb. Kew.)—Suffrutex, caulis glaber, foliorum limbi 0,02–0,025 longi 0,02 lati.

γ. *Folia neque peltata nec cordata.*

P. defoliata; foliis alternis petiolatis subrhombeo-elliptico-lanceolatis utrinque acutis superior. subrotundatis utrinque hirsuto-pubescentibus siccis rigidulis subopacis 5-nerviis, petiolo hirsuto, amentis axillaribus terminalibusque subdensifloris, ovario post anthesin immerso, bacca ovato-globosa emersa apice mucronulata.—In Andibus Bogotensibus, alt. 2650 (Triana, n. 51, Herb. Cand.).—Suffrutex, caulis basi aphyllus hirsutus subtetragonus plicato-sulcatus, foliorum limbi 0,025 longi 0,015 lati, petioli 0,006 longi.

P. San-Carlosiana; foliis alternis longiuscule petiolatis ovato-rhombeis apice acutis obtusiusculisve utrinque puberulis margine ciliolatis siccis tenuiter membranaceis pellucidis 3–7-nerviis, petiolis glabris amentis terminalibus elongatis, folia multoties superantibus subremotifloris, ovario subimmerso.—In Venezuelæ valli San Carlos (Fendler, n. 1151, Herb. Cand.).—Herba glabra, caulis erectus simplex basi radicans? siccus complanato-membranaceus, foliorum limbi 0,045, petioli 0,02, amenta usque ad 0,2 longa.

P. petiolaris; foliis alternis inferioribus longe superioribus modice petiolatis inferioribus e basi cuneata obovatis superioribus subovato-rhombeis apice acutiusculis obtusiusculisve utrinque glabris siccis membranaceis 5-nerviis, petiolo glabro, amentis axillaribus terminalibusque solitariis folia multoties superantibus sublaxifloris, ovario post anthesin rachi impresso.—In insula Cuba (Wright, n. 2261, Herb. Cand.) et Costa-Ricæ sylvis (Hoffmann, n. 56 et 823, Herb. Reg. Ber.).

—Herba 0,25 propem. alta basi radicans glabra, foliorum limbi 0,025 longi 0,017 lati, petioli 0,025 longi.

P. Venezuelania; foliis alternis breviter petiolatis elliptico-lanceolatis apice acutiusculis mucronulatisque basi acutis utrinque glabris vel apicem versus ciliolatis siccis membranaceis subpellucidis utrinque crebre nigro-punctulatis 5-nerviis, ovario emerso, bacca hirtella.—In Venezuela prope coloniam Tovar, alt. 6500 (Fendler, n. 2618, Herb. Cand.).—Herba procumbens, caulis siccus complanatus glaber, foliorum limbi 0,035.

P. patula; foliis alternis petiolatis elliptico-lanceolatis apice obtusiusculis obtusisve basi cuneatis utrinque pubescentibus siccis membranaceis quintuplinerviis, petiolis dense pubescentibus, amentis plerumque apice ramulorum binatis sublaxifloris folia fere triplo superantibus, ovario immerso, bacca ovato-globosa apice oblique subrostellata.—In Venezuela prope coloniam Tovar, alt. 6500 (Fendler, n. 1166, Herb. Cand.).—Herba ad arborum truncos parasitica?, caulis patule ramosus pubescens, folia tenuissima viridia, foliorum limbi 0,07 longi 0,035 lati, petioli 0,01 longi.

P. Guadaloupensis; foliis alternis breviter petiolatis inferioribus cuneato-obovatis superioribus obovato-ellipticis apice obtusiusculis subattenuatis basi subcuneato-acutis utrinque glabris siccis rigidulis subpellucidis 5-nerviis vel raro 7-nerviis, petiolo glabro, amentis terminalibus densifloris, folia superantibus rachi puberula, ovario impresso bacca globosa immersa apice submucronulata.—In insula Guadaloupa (Ed. Jardin, n. 340, Herb. Lenormant et Herb. Cand.), ins. Cuba or. (Wright, n. 504, Herb. Cand.), Ecuador (Fraser, Herb. Cand.), ins. St. Croix (Herb. Cand.).—Suffrutex glaber, caules sicci subtetragoni subalati, foliorum limbi 0,03 longi 0,025 lati, petioli 0,003 longi.

α. pubescens; foliis supra glabris subtus parce pilosis.—In ins. Cuba orient. prope villam Monte de Verde (Wright, n. 511 et n. 1688, Herb. Cand.).—Foliorum limbi 0,035–0,05 longi, 0,015–0,02 lati.

P. lævis; foliis alternis vel apice imo ramulorum oppositis inf. subrhombeo-lanceolatis apice obtusiusculis lævissime emarginulatis basi subacutis utrinque glabris margine subtilissime ciliolatis siccis rigidulo-membranaceis subpellucidis noveno-nerviis, petiolo glabro, amentis terminalibus solitariis densifloris folia paulo superantibus, ovario subimmerso apice breviter rostellato.—In Venezuela prope coloniam Tovar, alt. 6500 (Fendler, n. 1165 et 1164, Herb. Cand.).—Fruticulus, caulis

lævis basi radicans procumbens glaber ramulos simplices vix 0,1 longos mittens, foliorum limbi 0,047 longi 0,02 lati, petioli 0,008 longi.

P. fragrans; foliis alternis subsessilibus suboblonge elliptico-lanceolatis apice longe acuminatis acutis basi in petiolum brevissimum cuneatim decurrentibus utrinque glabris siccis membranaceis pellucidis noveno-nerviis, amentis axillaribus terminalibusque apice ramulorum approximatis densifloris, ovario impresso.—In Venezuela inter rupes ad flumina Tuy et Maya, alt. 3000 (Fendler, n. 1156, Herb. Cand.).—Fruticulus herbaceus, caulis siccus complanatus subpellucidus quum siccatus fragrans, foliorum limbi 0,085 longi 0,023 lati.

P. Carlosiana; foliis alternis approximatis longe petiolatis ovato-lanceolatis basi subcordatis rotundatisve apice acuminatis siccis membranaceis pellucidis fusco-punctulatis utrinque glabris 7-nerviis, amentis axillaribus terminalibusque, ovario emerso.—In Venezuela ad flumen San Carlos (Fendler, n. 1148, Herb. Cand.).—Herba, foliorum limbi 0,08 longi 0,035 lati, petioli 0,06 longi.

P. Moulmeiniana; foliis alternis breviter petiolatis lanceolatis, basi acutis apice obtusiusculis utrinque glabris siccis membranaceis pellucidis 5-nerviis, amentis apice ramulorum subpaniculatim approximatis, ovario impresso.—In Moulmein (Parish, n. 118, Herb. Kew.).—Herba repens vel scandens? e basi radicans, caulis quadrangulus glaber, foliorum limbi 0,055 longi 0,025 lati, petioli 0,005 longi.

P. Lyalli; foliis alternis breviter petiolatis elliptico-oblongis basi cuneatis in petiolum decurrentibus utrinque glabris siccis membranaceis subobscuris uninerviis, amentis axillaribus solitariis subdensifloris, ovario basi immerso.—In insula Madagascar (Lyall, n. 308, Herb. Kew.).—Suffruticulus glaber, foliorum major. limbi 0,07, petioli 0,007–0,008 longi.

P. adscendens; foliis alternis petiolatis oblongo-elliptico-lanceolatis apice acutis basi cuneatim in petiolum decurrentibus utrinque glabris siccis coriaceis subopacis pellucide punctulatis penninerviis, centrali nervo ad $\frac{4}{5}$ alt. nervos alternos utrinque 9–10 mittente, amento terminali folia æquanti densifloro, ovario semi-immerso, bacca oblonga basi flavicanti.—In Venezuela prope coloniam Tovar, alt. 6500 (Fendler, n. 6153, Herb. Cand.).—Frutex? ad arborum truncos scandens (Fendler, l. c.), ramuli glabri sicci complanati ruguloso-plicatulati centim. crassis, foliorum limbi 0,26 longi 0,09 lati, petioli 0,025 longi.

3. *Ovarium vertice oblique complanatum vel scutello auctum sursum rostratum et antice stigmatiferum.*

a. Folia digitinervia.

P. cardiophylla; foliis alternis petiolatis e basi cuneata obovatis apice rotundatis apice imo emarginatis utrinque glabris vel apicem versus ciliolatis siccis membranaceis rigidulis subopacis 5-nerviis, amento terminali densifloro folia æquanti, pedunculo glabro petiolum fere duplo superanti, ovario impresso apice suboblique complanato subantice stigmatifero.—In valli Del Conca Novæ-Granatæ (Triana, Exsic. sin. num.).—Herba suberecta basi decumbens radicans, caulis fere 0,1 altus glaber, foliorum limbi 0,02–0,035 longi 0,012–0,02 lati, petioli 0,007 longi.

P. Choroniana; foliis alternis longe petiolatis ovato-rotundatis vel omnino rotundis ad $\frac{1}{3}$ alt. peltatis apice breviter protractis margine ciliatis siccis coriaceis, nervo centrali ad apicem ducto subtus conspicuo, cæteris fere inconspicuis, amentis axillaribus densifloris, ovario semi-immerso vertice peltatim gibboso apice rostellato antice stigmatifero.—In Venezuela inter Naracai et Choroni (Fendler, n. 2402, Herb. Cand.).—Herba procumbens, foliorum limbi 0,1–0,12 longi 0,09–91 lati, petioli 0,09 longi.

P. procumbens; foliis alternis longissime petiolatis rotundis vel subovato-rotundis utrinque glabris siccis subcoriaceis 5-nerviis, amento terminali, ovario vertice scutatim breviter aucto medio scutelli stigmatifero, bacca ovato-attenuata mucronulata.—In Peruvia orientali prope Tarapoto (Spruce, n. 4279, Herb. Kew.).—Herba procumbens, foliorum limbi 0,065 longi 0,07 lati, petioli 0,08 longi, pedunculi 0,045 longi, amenta 0,05 longa.

α. amentis minoribus baccis ovato-cylindricis apice rostratis.—Prope Tarapoto (Spruce, n. 4279 *a*, Herb. Kew.).

P. Casaretti; foliis alternis longiuscule petiolatis subrotundis apice rotundatis basi læviter subattenuatis vel rotundis supra appresse puberulis subtus glabris siccis membranaceis vel rigidulo-membranaceis subopacis 5-nerviis, petiolo appresso puberulo, amentis oppositifoliis folia æquantibus densifloris, ovario semi-immerso oblongo acuminato rostellato antice supra medium stigmatifero.—In Brasilia, prope Rio Janeiro (Casaretto, n. 1041, Herb. Cand.).—Herba procumbens e nodis radicans, ramuli appresse puberuli filiformes, foliorum limbi 0,025 in diam., petioli 0,015 longi.

P. Cubensis; foliis alternis longiuscule petiolatis deltoideo-cordatis utrinque glabris siccis membranaceo-pellucidis 5–7-nerviis, petiolis glabris, amentis pedunculum communem axillarem petiolo breviorem terminantibus plerumque geminatis, ovario immerso oblique rostrato antice stigmatifero.—In insula Cuba (Wright, n. 499, Herb. Cand.).—Herba scandens, foliorum limbi 0,05, petioli 0,03 longi.

b. Folia multiplinervia.

P. sylvestris; foliis alternis longe petiolatis ellipticis utrinque acutis vel ovato-attenuatis utrinque pubescentibus siccis rigidulis subopacis triplinerviis, amentis axillaribus solitariis longissime pedunculatis densifloris brevibus, ovario basi immerso apice subantice stigmatifero bacca cylindricea apice rostrata.—Basi Cordillarum in via ad Quito (Jameson, Herb. Kew.).—Herba repens, caulis filiformis, foliorum limbi 0,01 longi 0,007 lati, petioli 0,01, pedunculi 0,025 longi.

P. septuplinervia; foliis alternis longe petiolatis oblongo-ovatis apice breviter acuminatis acutis basi rotundatis paulo supra basin peltatis utrinque pubescentibus dein supra glabratis siccis subcoriaceis opacis septuplinerviis, petiolo pubescenti, amentis apice caulis plerumque geminatis densifloris, folia superantibus, ovario post anthesin immerso apice rostrato antice supra rostrum stigmatifero, bacca subovata apice rostrata.—In insula Cuba (Wright, n. 2260, Herb. Cand.).—Suffruticulus? herbaceus, caulis hirtello-pubescens, foliorum limbi 0,16 longi 0,08 lati, petioli 0,095 longi.

P. succulenta; foliis alternis breviter petiolatis suboblongo-lanceolatis apice obtusiusculis basin versus cuneatis in petiolum decurrentibus utrinque glabris apicem versus subtilissime ciliolatis siccis membranaceis subpellucidis noveno-nerviis, petiolo glabro, amentis axillaribus terminalibusque apice ramulorum approximatis adspectu binatis densifloris, ovario semiimmerso apice rostrato subantice stigmatifero, bacca ovata apice suboblique rostrata flavicanti.—In Venezuela, prope coloniam Tovar (Fendler, n. 1157 et 1155, Herb. Cand.).—Herba ramulosa glabra, ramuli subtetragoni, foliorum limbi 0,09 longi 0,02 lati, petioli 0,015 longi.

P. acutifolia; foliis alternis petiolatis oblongo-lanceolatis apice acutis basi in petiolum decurrentibus acutis utrinque glabris margine ciliolatis siccis membranaceis subpellucidis, centrali nervo ad apicem ducto utrinque ad ⅘ alt. nervos alternos subadscendentes mittente, amentis apice

caulis binatis densifloris folia æquantibus, ovario subimpresso apice triangulariter attenuato antice supra medium stigmatifero, bacca cylindrica apice suboblique mucronulata.—In Peruvia orientali, prope Tarapoto (Spruce, n. 4094, Herb. Cand.).—Herba 0,06 circ. alta basi radicans glabra, foliorum limbi 0,045 longi 0,005 lati.

P. decurrens; foliis alternis petiolatis elliptico-lanceolatis apice acutis acutiusculisve basi in petiolum decurrentibus utrinque glabris siccis membranaceis subpellucidis, centrali nervo ad apicem ducto utrinque ad $\frac{3}{4}$ alt. nervos alternos subadscendentes 3–4 venasque fortiores mittente, amentis apice ramulorum binatis, ovario immerso apice subscutatim rostrato infra nostrum antice stigmatifero scutello et rostro flavis.—In Venezuela prope coloniam Tovar alt. 7530 (Fendler, n. 1152 et 1169, Herb. Cand.).—Suffrutex basi decumbens radicans glaber, caulis herbaceus, foliorum limbi 0,08–0,1 longi 0,04–0,06 lati.

P. piperea; foliis alternis longe petiolatis ovato-acuminatis acutis utrinque glabris siccis membranaceis pellucidis septuplo-novenonerviis, petiolo glabro a medio basin versus alato, alis linearibus, amento densifloro, baccis patentibus ovatis basi subimmersis apice scutatim breviter auctis.—In Guiana (Parker, Herb. Kew.).—Caulis glaber teres lignosus, foliorum limbi 0,06–0,075 longi 0,03 lati, petioli 0,04 longi.

P. glabra; foliis alternis petiolatis e basi cuneata obovatis apice breviter acuminatis basi in petiolum decurrentibus utrinque glabris siccis membranaceo-rigidis opacis, nervo centrali ad apicem ducto utrinque nervos subtiles 6–7 mittente, petiolo glabro, amentis terminalibus solitariis crassis densifloris, pedunculo petiolum duplo superanti, bacca cylindrica apice mucronulata subantice stigmatifera.—In Venezuela, prope coloniam Tovar (Fendler, n. 1153, Herb. Kew.).—Herba glabra, caulis procumbens basi radicans, foliorum limbi 0,19 longi 0,08 lati, petioli 0,02 longi.

P. reptans; foliis alternis longiuscule petiolatis e basi cordata ovato-rotundis supra hirsutis subtus ad nervos pubescentibus siccis rigidulis subopacis 5-nerviis, petiolo hirsuto, amentis axillaribus terminalibusque solitariis longiuscule pedunculatis, pedunculo hirsuto petiolum æquanti, ovario subimpresso oblongo-triangulari apice subito in rostrum brevem subulato antice stigmatifero postea pubescenti.—In prov. Barbacoas Novæ-Granatæ ad viam Tuquerras, alt. 600 m. (Triana, n. 58, Herb. Cand.).—Herba hirsuta repens e nodis radicans, caulis filiformis hirsutus, foliorum limbi 0,012 longi 0,015 lati, petiolo 0,013 longi.

P. ciliaris; foliis alternis infer. longe super. modice petiolatis elliptico-rotundis utrinque obtusis utrinque glabris margine subfusce ciliatis siccis coriaceis opacis, petiolo ciliato, amentis terminalibus solitariis longe pedunculatis ovario impresso vertice oblique triangulariter subscutatim complanato rostrato medio scutelli stigmatifero.—In prov. Buenaventura Novæ-Granatæ, alt. 112 m. (Triana, n. 59, Herb. Cand.).—Suffruticulus procumbens e medio radicans ramosus, caulis filiformis, foliorum limbi 0,02–0,03 longi 0,02–0,023 lati, petioli 0,04–0,13 longi.

P. ciliosa; foliis alternis longe petiolatis ellipticis vel elliptico-rotundatis utrinque obtusis utrinque glabris margine incane ciliatis siccis coriaceis opacis, amentis terminalibus solitariis longe pedunculatis densifloris, ovario semi-immerso apice rostrato antice supra medium stigmatifero.—In prov. Barbacoas Novæ-Granatæ ad viam Tuquerras, alt. 800 m. (Triana n. 60, Herb. Cand.).—Herba repens e nodis radicans, caulis glaber, foliorum limbi 0,06 longi 0,05 lati, petioli 0,04 longi.

B. *Folia opposita.*

P. Pichinchæ; foliis oppositis breviter, petiolatis glabris orbiculato-reniformibus apice obtusis basi in petiolum subdecurrentibus quintuplinerviis.—In vallibus Pichinchæ (Jameson, n. 747, Herb. Kew.).—Herba repens e nodis radicans glabra, caulis glaber, foliorum limbi 0,005, petioli 0,0015 longi.

P. Chiliensis; foliis basi caulis interdum alternis apice oppositis petiolatis ellipticis utrinque obtusis apice aliquando brevissime protractis supra glabris subtus ad nervos puberulis margine apicem versus ciliatis siccis pellucido-membranaceis subtiliter 3–5-nerviis, amentis axillaribus solitariis ovario post anthesin immerso apice rostellato antice stigmatifero.—In Chili (Lechler, n. 3020).—Herba super arborum truncos scandens, caulis striatus puberulus, foliorum maj. limbi 0,025, petioli 0,008 longi.

C. *Folia verticillata.*

1. *Ovarium apice imo stigmatiferum.*

P. Mathewsii; foliis inferior. verticillatis longe petiolatis super. ternis subsessilibus omnibus orbicularibus utrinque glabris siccis pellucido-membranaceis basi inconspicue 3–5-nerviis, amentis apice pedunculi communis axillaris 5-verticillatis, ovario apice stigmatifero,

acea ovato-attenuata rugulosa.—In Peruvia ad Chachapoyas (Mathews, Dern. Collec. Herb. Boiss.)—Herbula sub 0,1 alta glabra, foliorum limbi 0,025 longi, petioli majores 0,035 longi.

2. *Ovarium apice oblique stigmatiferum.*

a. Minores.

P. linearis; foliis plerumque quinis petiolatis lineari-ellipticis apice obtusis supra pilosulis siccis membranaceo-pellucidis basi 3-nerviis, amentis terminalibus solitariis densifloris, ovario subimmerso apice et paulo antice stigmatifero.—In sylvis Andium Quitensium (Jameson, n. 89, Herb. Cand.), et Venezuela ad coloniam Tovar (Fendler, n. 11676, Herb. Cand.).—Herbula repens, caulis filiformis, foliorum limbi 0,01 longi 0,002 lati, petioli 0,003–0,006 longi.

b. Grandiores coriaceæ.

P. Botterii; foliis ternis quaternisve petiolatis ovato-acuminatis apice obtusiusculis basi rotundatis vel elliptico-lanceolatis subrhombeisve apice obtusiusculis basi acutis utrinque ad nervos præsertim pilosulo-pubescentibus siccis membranaceis 5-nerviis, amentis axillaribus terminalibusque filiformibus folia duplo superantibus ovario semimmerso ovato apice fere imo suboblique stigmatifero.—In Mexico (Botteri et Salle, Herb. Cand.).—Fruticulus ?, caulis simplex ?, foliorum limbi 0,04 longi 0,025 lati, petioli 0,015 longi.

P. lanceolata; foliis quaternis breviter petiolatis lanceolatis utrinque acutis basi in petiolum subdecurrentibus ad nervos supra pubescentibus subtus glabris siccis rigidulo-membranaceis subpellucidis 5-nerviis, amentis verticillatis axillaribus breviter pedunculatis filiformibus subdensifloris folia duplo superantibus, ovario semiimmerso apice oblique acutato paulo antice stigmatifero.—In reipublicæ æquatorialis Andibus Quitensibus (Spruce, n. 6110, Herb. Cand.) et sylvis umbrosis Andium Quitensium, alt. 900 ped. (Jameson, n. 343, Herb. Cand.).—Suffrutex ?, ramuli ad nodos hirtelli, foliorum limbi 0,035 longi 0,012 lati, petioli 0,003 longi.

P. Macraeana; foliis ternis longe petiolatis elliptico-lanceolatis apice acutiusculis basi acutis supra glabris subtus ad nervos tenuissime puberulis siccis membranaceo-rigidulis subpellucidis septuplo-novenonerviis, amentis filiformibus densifloris, ovario impresso apice subantice stigmatifero.—In Insul. Sandwich. Owhyhee ad montem Kaah (Macrae, Herb. Soc. Hort. Lond. in Herb. Brit. Mus.).—Suffrutex, ramuli glabri vel

ochraceo-puberuli, foliorum limbi 0,07–0,09 longi 0,03–0,06 lati, petioli 0,04 longi.

P. Boivini; foliis 3–4-verticillatis breviter petiolatis elliptico-obovatis apice obtusis basi cuneatis utrinque glabris siccis rigidis opacis 3-nerviis, amentis axillaribus subdensifloris folia multot. superantibus, ovario impresso apice obtuso subantice stigmatifero.—In insula Mohely (Boivin, Herb. Brit. Mus.).—Suffruticulus procumbens glaber, foliorum limbi 0,02 longi 0,011 lati, petioli 0,01 longi.

P. pedunculata; foliis plerumque ternis breviter petiolatis subrhombeo-ellipticis ellipticisve apice obtusis basi acutiusculis utrinque pubescentibus siccis rigidulo-membranaceis subopacis nigro-punctatis trinerviis, petiolo pubescenti, amentis axillaribus terminalibusque solitariis vel apice caulis confertis filiformibus subdensifloris folia duplo-triplove superantibus longe pedunculatis, pedunculo petiolum multoties folia duplo superanti, ovario impresso ovato apice oblique stigmatifero. In insul. Bourbon (Herb. Rich. in Herb. Francav.).—Suffrutex?, in sylvis inter detritus foliorum et muscos (Herb. Rich. l. c.), foliorum limbi 0,03 longi 0,016 lati, petioli 0,007 longi.

P. Dominicana; foliis ternis vel apice ramulorum oppositis breviter petiolatis subrhombeo-ellipticis apice attenuato-obtusiusculis basi attenuato-acutiusculis utrinque glabris siccis coriaceis opacis septemnerviis, amentis terminalibus solitariis filiformibus densifloris ovario emerso apice acutato oblique stigmatifero.—In insul. St. Domingo (Herb. Rich. in Herb. Francav.).—Suffrutex, foliorum limbi 0,045 longi 0,02 lati, petioli 0,005 longi.

P. olivacea; foliis plerumque quinis breviter petiolatis subspathulato-oblongis apice obtusis obtusiusculisve basi subcuneatis 3-nerviis utrinque glabris siccis coriaceis subopacis subtus olivaceis rugulosis, amentis axillaribus terminalibusque filiformibus densifloris, folia multoties superantibus pedunculo petiolum multoties superanti, ovario emerso apice oblique acutiusculo subantice stigmatifero.—In Costa Rica (Hoffmann, n. 810, Herb. Reg. Ber.).—Suffrutex erectus e basi radicans, rami ramulique dense pubescentes, foliorum limbi 0,017 longi 0,006 lati, petioli 0,004 longi.

P. Casapiana; foliis ternis petiolatis ovato-acuminatis utrinque piloso-pubescentibus siccis membranaceis pellucidis 3-nerviis petiolo piloso-pubescenti, amentis axillaribus verticillatis filiformibus subremotifloris, baccis semiimmersis ovatis apice brevissime mucronulatis.

—In Peruvia, prope Casapi (Mathews, n. 1689, Herb. Kew.).—Herba, caulis piloso-pubescens, foliorum maj. limbi 0,05 longi 0,03 lati, petioli 0,008 longi.

(*To be continued.*)

EXOTIC PLANTS ABOUT LONDON IN 1865.

By Henry Trimen, M.B. Lond., F.L.S.

The year 1865 was remarkable for its high temperature from April to September. The average temperature of April was (roughly speaking) 53° F., being no less than 6·75° F. above the mean of the last fifty years. On the 27th the highest temperature ever registered in the month was noticed, 81·5° F. May, June, and July all showed a mean temperature considerably above the average, and there were some remarkably high readings registered, but the mean temperature of August fell somewhat below the usual average (1·0° F.). The first twenty days of September were excessively hot, the average of that period, 64·5° F., is 10° F. above the mean of fifty years. Scarcely a drop of rain fell during three weeks. On the 8th, 86° F. was registered, a temperature never equalled in September (except on 6th, in 1846); and the mean temperature, 72·1° F., was higher than that of any day since August 12th, 1861. On the 20th, a thermometer hung in the open air facing the south at Southampton showed, at 11 A.M., 119° F. The mean temperature of the month was nearly 64° F., being about 7·5° above the mean of the last fifty years.

The mean temperature of the whole of the six summer months (April to September inclusive) was about 3° F. above the mean of the same six months during fifty years.

This unusual heat could not but influence vegetation to an important extent. It may, therefore, be worth while to put on record the occurrence of numerous exotics about London last year, the luxuriant growth of some which I believe to be possible in this country only in years with an exceptionably high mean summer temperature.

Mitcham, Surrey, has a rich soil in good cultivation, and the neighbourhood has long been known as a garden on a large scale for the growth of officinal plants. On a farm to the north of the Common

there appeared last summer a large number of foreign plants, many of which I collected in two visits I paid the locality with my friend Mr. Naylor, of Edinburgh, who detected the station, and who went several times to the spot, and always succeeded in finding something new.

The origin of these plants is the same ultimately as that of the exotics found at Wandsworth—the sweepings of corn used and stored up at Messrs. Watney's brewery at Thames' side. This refuse is sold to farmers in the neighbourhood as manure for grass lands, but its small fertilizing value must certainly be overbalanced by the evident risk of introducing foreign weeds into the cornfields round. This, however, has not been considered by the Surrey farmers, who pile the "manure" in heaps on the borders of the fields till wanted; and it is on and around these heaps that the exotics sprang up last year in great abundance. Their origin is evident, and is now clearly stated in order that no mistakes may be made in future by botanists who may find these certainly alien plants, which have no claim whatever as yet to a place in our Flora. Should any become naturalized permanently in the district, it is still more important that the history of their introduction should be known.

Appendix B. of Brewer's 'Flora of Surrey' is a list of the exotics collected by Messrs. Irvine, Woods, Britten, and others, on the ground at Wandsworth where the refuse of the distillery was thrown out and corn sifted. A few more species are recorded in the new series of the 'Phytologist,' and in Mr. Irvine's 'Handbook of British Plants.' These plants were noticed in 1851, and, though at first numerous, few retained their ground many seasons. In 1863, I saw only about twenty species.

The origin of the Mitcham and Wandsworth plants being identical, the species are, as might be expected, in the main the same. Nearly half, however, of those enumerated in the following list have not been recorded from Wandsworth. It is probable that the more favourable conditions of soil and situation caused many seeds to germinate at Mitcham which would have perished in the exposed ground at Wandsworth; and it is certain that all the plants attained a greater degree of luxuriance and perfection of growth in the former than the latter place. I have little doubt, however, that the high temperature of last season enabled several species to come to maturity which in ordinary years would have died.

An advantage attending the unchecked growth of these plants is found in the easier determination of their names. In the stunted specimens alone obtainable at Wandsworth this was often difficult, and I have a suspicion that some names in Mr. Irvine's list may refer to allied species given in mine.

I have here recorded no plants of whose nomenclature I am not satisfied. I do not doubt that four times the number were seen, but a few certain facts are preferable to a number of doubtful observations. Had I thought at the time of publishing a list, I would have collected more and better specimens; but, if the coming summer be favourable, no doubt a plentiful crop of novelties will be produced.

The species are mostly Mediterranean; there are several from Central Europe, from Istria and the country round Trieste, and a few species are Egyptian or Syrian. There are also two or three cereals of Europe. Some are likely enough to become cornfield weeds in this country, of the class represented by *Agrostemma*, *Silene anglica*, the Papavers, and *Chrysanthemum segetum*, and some have long been known as naturalized plants. Those marked W. are included in the Wandsworth published lists.

Ranunculus arvensis, *L.*
Nigella Damascena, *L.* A few specimens.
W. Papaver hybridum, *L.*
W. Rœmeria hybrida, *De Cand.*
W. Glaucium Phœniceum, *Crantz.* Abundant.
Sisymbrium Sophia, *L.*
W. Erysimum orientale, *R. Br.* Abundant and spreading to the roadsides, etc., near.
Camelina fœtida, *Fr.* Common.
W. Neslia paniculata, *Desv.*
W. Sinapis incana, *L.*
Erucaria latifolia, *De Cand.* Abundant.
W. Saponaria Vaccaria, *L.*
Silene muscipula, *L.* Several plants.
W. S. anglica, *L.*
W. Malva parviflora, *L. herb.!* Agrees quite with this in the characters of calyx and fruit, but approaches *M. verticillata*, L., in habit, being erect and several feet high. Common.
Ononis mitissima, *L.* Several plants.
Medicago maculata, *Willd.*
W. M. denticulata, *Willd.*, and *var.* β.
M. apiculata, *Willd.*
Trigonella laciniata, *L.* Scarce.
W. Melilotus parviflora, *Desf.*
Trifolium supinum, *Savi ?* Flowers yellow. Abundant.
W. T. resupinatum, *L.*
W. T. elegans, *Savi.*
W. Lathyrus Aphaca, *L.*
W. Arthrolobium scorpioides, *De Cand.* Scarce.
W. Lythrum hyssopifolium, *L.* A small upright form. Common and well established.
Ammi Visnaga, *Lam.* Abundant.
W. A. majus, *L.* Scarce.

W. Bupleurum protractum, *L.* Abundant.
Caucalis leptophylla, *L.* Common.
W. Anthemis tinctoria, *L.*
W. Chrysanthemum coronarium, *L.*
C. segetum, *L.*
Calendula arvensis, *L.* Common.
Carduus acanthoides, *L.* Apparently various hybrid forms between *C. crispus*, L., and *C. nutans*, L. Abundant.
W. Centaurea Calcitrapa, *L.*
W. C. solstitialis, *L.*
W. C. Cyanus, *L.*
Crepis setosa, *Hall.*
Anchusa officinalis, *L.* A few plants.
W. Echium violaceum, *L.* A few plants.
W. Anagallis cœrulea, *Schreb.* Abundant.
W. Plantago Lagopus, *L.*
W. Amaranthus retroflexus, *L.* Common.
Kochia scoparia, *Schrad.* Common.
W. Chenopodium opulifolium, *Schrad.* Common and well-established.
C. polyspermum, *L.*, *var. α.* cymoso-racemosum, *Koch*, and *var. β.* spicato-racemosum, *Koch.*
W. Beta maritima, *L.*
Atriplex rosea, *L. non Bab.* Very variable in appearance. Common.
Rumex palustris, *Sm.* Perhaps *R. limosus*, Thuil.
Ricinus sp. —— ? A few plants. Very luxuriant.
Panicum miliaceum, *L.* Common.
Setaria viridis, *Beauv.* Abundant.
S. glauca, *Beauv.* Not common.
Phalaris Canariensis, *L.*
W. P. minor, *Retz.* Common.
W. P. paradoxa, *L.* Abundant.
Polypogon maritimus, *Willd.* Scarcely distinct from *P. Monspeliensis*, Desf.
P. littoralis, *Sm.* Rather scarce.
W. Bromus arvensis, *L.*
W. B. tectorum, *L.* Common.
W. B. maximus, *Desf.* Scarce.
Secale cereale, *L.*
Hordeum hexastichon, *L.*

Setaria viridis, though an evident introduction at Mitcham, was recorded by Hudson more than a century back as growing copiously at Battersea, and has frequently been observed there since his time. Many exotics do not grow in this country every season, and I believe this is the case with this plant. Last September it was in vast quantity and of large size along the river-bank of Battersea Park, mixed with *S. glauca*, *Brassica Napus*, and *Königa maritima*. *Panicum Crus-Galli*, also mentioned as a Battersea plant by Hudson, was abundant there last year. I have frequently been at the same place at the same time of year, but never met with these grasses, and cannot but suppose their appearance in such plenty due to the exceptional temperature of September, 1865.

Potentilla recta, L. (a form with small petals). In plenty on the railway bank at Mitcham station last June, but perhaps the remains of a garden.

Mimulus moschatus? (the Musk Plant of gardeners.) Among grass by the river Wandle at Mitcham, in a perfectly wild state. September, 1865.

The following plants were collected at the beginning of August by Mr. Thiselton Dyer, during a visit to the site of the International Exhibition of 1862, at South Kensington:—

Glaucium luteum, *Scop.*
Barbarea præcox, *R. Br.*
Camelina fœtida, *Fr.*
Malva crispa, *L.*
Melilotus cœrulea, *Lam.*
Trifolium resupinatum, *L.*
Œnothera biennis, *L.*
Artemisia scoparia, *W. and K.* In great plenty.
Physalis Alkekengi, *L.*
Hyoscyamus albus, *L.*
Nicotiana rustica, *L.*
Datura Stramonium, *L.*, and D. Tatula, *L.*
Veronica Buxbaumii, *Ten.*
Chenopodium polyspermum, *L.*, *var.* cymoso-spicatum, *Koch.*
Panicum Crus-Galli, *L.*
P. miliaceum, *L.*

And at the same place, Mr. Naylor collected the following in October:—

Hibiscus Trionum, *L.*
Carduus arvensis, *Curt.*, *var.* setosus = Cirsium setosum, *M. Bieb.*
Verbascum Lychnitis, *L.*
Euphorbia platyphylla, *Koch.*
Mercurialis annua, *var.* β. ambigua, *L.*

It is not so easy to trace the origin of these plants, as in the case of those at Mitcham and Wandsworth. They are, however, as incontestably derived from foreign seeds, perhaps brought with packing material.

ABSTRACT OF AN OFFICIAL REPORT ON THE PROGRESS AND CONDITION OF THE ROYAL GARDENS AT KEW, DURING THE YEAR 1865.

BY J. D. HOOKER, M.D., F.R.S.A., ETC. ETC., DIRECTOR.

Royal Gardens, Kew, W., January 1, 1866.

The number of visitors to the Royal Gardens during the past year has been 55,934 in excess of that of 1864; the distribution being:— on Sundays, 260,040; on week-days, 269, 201; total, 529,241.

In presenting the report for the past year, I have, in the first place, the painful duty of announcing the decease of the Director, Sir W. J.

Hooker, on the 12th August last, and I have to add, that on the 1st of November I was appointed as his successor. The office of Assistant Director has been suppressed, as the duties hitherto attached thereto can be more efficiently and economically performed by raising the position of the Curator, and that of the Keeper of the Herbarium and Library; and by transferring to the latter department the supervision of the Museums, and the naming of the collections in these, and in the Arboretum, plant-houses, and gardens generally.

1. *Botanic Gardens.*—The labelling of the plants, both common and rare, requires immediate attention. Their present unsatisfactory condition in this respect is due partly to the fact that the repotting of so vast a collection (containing, perhaps, 20,000 plants) involves the loss of some labels, and the displacement of many more; and very much to the want, for many months, of a good foreman for the lawns, Arboretum, and shrubberies, the labels of the plants in this department being particularly liable to be removed by mowers, and by the public in traversing the grounds.

A very important step taken this year has been the conversion of the old Victoria-house into an "Economic plant-house," to be devoted henceforth to the display of a selected set of tropical plants, whose products are useful for food, or as drugs, or in the arts. The house itself being small, the specimens will be so also, and all will thus be brought within a moderate space.

In the Palm-house the whole collection has been repotted and rearranged, and the house itself has been thoroughly set to rights in respect of order, cleanliness, and the cultivation of the plants, which are for the most part in excellent condition. Certain tropical plants that produce a striking effect from the size and vivid green of their foliage have been introduced into the beds between the Palm-stems.

A small collection of Japan plants has been got together, and placed in a conspicuous position, in a frame near the Heath-house.

The collection of Cacti, Aloes, succulents, and bulbs, in No. 7, has been for the most part repotted and very greatly improved; and has also been materially increased.

From India and the Colonies most satisfactory accounts continue to be received of the progress of botany and horticulture under the various colonial botanists, and heads of botanic gardens, who have for the most part been sent out from Kew by the late Director, and who

receive liberal encouragement from the Governors and other authorities.

From Ceylon ripe seeds of *Chinchona officinalis* have been sent to Kew by the able and energetic Director of the Royal Botanic Gardens. These we have transmitted at once to Jamaica and Trinidad, whilst others have been sent by Mr. Thwaites to the Mauritius, Cape of Good Hope, Queensland, and elsewhere. As the first-fruits of the introduction of the Chinchona into our eastern possessions, this event marks an epoch in the history of the drug, and reflects great credit on the energetic manager of the plantations. In India proper, under the superintendence of Mr. M'Ivor, in the Neilgherries, Dr. Anderson at Calcutta, and Mr. Mann at Darjeeling, the Chinchona plantations are being immensely extended, and the plants given out to cultivators; and I am informed that at Darjeeling there had been a sale of plants to the settlers at 6*d.* each. It has been found that an infusion of the leaves is an excellent febrifuge, and it is hence much to be desired that this plant should be cultivated even in islands where its growth is not rapid, nor its propagation easy, and where its cultivation for bark is unprofitable, if only its foliage is produced in tolerable abundance; for no tropical locality in any quarter of the globe enjoys immunity from diseases for which the Chinchona leaf may not afford a specific.

In Trinidad, Mr. Prestoe, who was last year sent from Kew to be superintendent of the Botanic Gardens there, has succeeded in cultivating the Chinchona, and will doubtless meet with the same success in propagating it as has rewarded the efforts in India.

From the promising colony of Queensland, his Excellency Sir G. Bowen has communicated the important news that Mr. Walter Hill, Director of the Brisbane Botanic Gardens (who also went there from Kew), has discovered a magnificent well-watered tract of the richest agricultural land at Rockingham Bay, a salubrious district, and admirably suited for the cultivation of sugar, cotton, indigo, etc., and which the Governor has directed shall be retained for Government reserves. It is a singular fact, that for the discovery of the Liverpool plains in New South Wales, and of their suitability for colonial purposes, that colony is indebted to another botanist, also sent out from Kew, the late Allan Cunningham. Mr. Hill's Garden report for this year records the complete success at Brisbane of the coffee, cinnamon, mango, tamarind, cotton, allspice, ginger, indigo, and to-

bacco; also of the *Chinchona Calisaya*, sent from Kew. A library for this institution has been selected, and several hundred volumes sent out this year.

From the Cape of Good Hope most valuable reports have been received from the Rev. Dr. Brown, colonial botanist, treating of the conservation of the forests of that colony, the destruction of which by fire has led to the sterility of large tracts of once well-watered land; and of the development of the agricultural resources and botanical riches of South Africa generally, and collateral subjects. The cultivation of the Olive seems to promise to become of great importance in that colony, and I have been desired to procure and transmit the best kinds.

Ascension Island.—Captain Barnard's excellent report gives a satisfactory account of the progress of the imported vegetation in this once sterile island, which we continue to supply with plants. It now possesses thickets of upwards of forty kinds of trees, besides numerous shrubs and fruit trees, of which, however, only the Guava ripens. These already afford timber for fencing cattle yards. I may mention, that when I visited the island in 1843, owing to the want of water, but one tree existed on it, and there were not enough vegetables produced to supply the Commandant's table; whereas now, through the introduction of vegetation, the water supply is excellent, and the garrison and ships visiting the island are supplied with abundance of vegetables of various kinds.

The most important plants distributed from the Royal Gardens have been Chinchona seeds and plants to various colonies, etc., and the Ipecacuanha to Trinidad, Ceylon, and Calcutta. A most important introduction has been the Calumba root from the Mauritius, a plant which it is proposed to cultivate in Ceylon and the West Indies, some eminent druggists having reported to us that the supply from East Africa is both scanty and bad; and that, owing to the condition of labour, etc., on the African coast, there is no prospect of an improvement.

Various applications for seeds of the best kinds of tobacco having been received, especially from Western Australia, through the kindness of Colonel Scott, R.E., we procured from Captain Smith, resident at the Court of Persia, an ample supply of fresh seed, of the best Shiraz Tobacco, which has been distributed to thirty or forty colonies, etc.

Gardeners trained in the Royal Gardens have been selected by the late Director to fill the following important posts:—

The Curatorship of the Royal Botanic Gardens at Calcutta, under Dr. Anderson.

An Assistant Conservatorship of Chinchona forests at Darjeeling, under the same officer.

Most valuable collections of plants and seeds for the Botanic Garden and Pleasure Grounds, have been received.

The usual correspondence and exchanges have been kept up. 5600 packets of seeds have been distributed, of which 2600 were hardy trees and shrubs, chiefly to Melbourne, India (for the Himalaya mountains and Punjab), Ascension Island, South Africa, Hamburg Botanic Gardens, and Nova Scotia. Also sixteen Ward's cases, containing about 350 plants; and 450 plants (roots, bulbs, cuttings, etc., in boxes).

Museums.—Nothing new of any importance has taken place in this department. A new edition of the Museum Guide is in the press. Most valuable accessions have been received.

Herbarium, etc.—I have to announce the acquisition by this department of two of the most important private collections that existed anywhere in Europe; viz. Dr. Lindley's collection of Orchids, by purchase: and the late Dr. Burchell's South African and South American herbarium, by gift from his sister (who is also since deceased). Dr. Lindley's collection of Orchids is the key to the nomenclature of this vast and important family of plants; it was commenced when the first importation of them took place, and has been kept up by purchase and contribution from every quarter for nearly half a century, and will always be the standard of reference. It contains upwards of 3000 specimens, in perfect condition, fastened upon cartridge-paper, and copiously illustrated with sketches and dissections by Dr. Lindley's own hand and from other sources. Dr. Burchell's collections are of immense extent, in excellent preservation, and of especial scientific interest on account of the systematic manner in which he noted the geographical area of every species he met with, and daily catalogued them in an Index Geographicus. His first collections were made at St. Helena, in 1810, and contain a number of plants peculiar to that singular oceanic spot, and which have never since been found; being now, no doubt, extinct. His South African travels extended nearly

to the tropic, and occupied five years; they include 4856 species, and perhaps 12,000 ticketed specimens. In South America, in 1825, he entered the Brazils at Rio de Janeiro, and thence travelling northward, he traversed the entire length of that immense kingdom, by a route previously followed by no European, and descending the Tocantins river to the Amazons, arrived at Pará in 1830. His Brazilian collections amount to 11,765 distinct numbers, and nearly 52,000 specimens. Dr. Burchell died in 1863, and left these treasures to his sister; she offered them to her brother's friend, the late Director, who, with your permission, accepted them for the Herbarium of the Royal Gardens. These two collections (Lindley's and Burchell's) would certainly have fetched a very large sum if they had gone into the market.

A very important Herbarium of Sandwich Island plants (560 species) has been presented by Dr. Hillebrand, of those islands.

Dr. Mueller continues to transmit his invaluable Australian Herbarium and notes for the purpose of assisting Mr. Bentham in the Australian Flora; together with specimens of all the recent discoveries made on that continent for our own Herbarium.

M. Naudin has sent a beautiful set of the *Cucurbitaceæ*, cultivated by him in the Paris garden, etc.

The plants of Lieut.-Col. Pelly's Arabian journey have been presented by that officer, and determined at Kew.

The principal works published in connection with the Herbarium and Library have been:—

The second part of the 'Genera Plantarum,' by Mr. Bentham and Dr. Hooker. The third volume of Mr. Bentham's 'Flora Australiensis.' The third volume of Drs. Harvey and Sonder's 'Flora Capensis' (published), and a very valuable and laborious essay on the African *Leguminosæ*, by Mr. Bentham, published by the Linnean Society. The Flora of Tropical Africa is being prepared by Professor Oliver.

The botanists who have spent a considerable time at Kew for the purpose of studying in the Library and Herbarium, have been:—Prof. Mettenius, of Leipzig, publishing in Ferns; Prof. Baillon, of Paris; Dr. Triana, of New Granada; Dr. Seemann, F.L.S., in publishing his 'Flora Vitiensis;' Dr. Thomson, F.R.S., studying Indian plants; Dr. Welwitsch, F.L.S., arranging, etc., his vast tropical African Herbarium; Prof. Reichenbach, of Hamburg, studying Lindley's and other

Orchidaceæ; Dr. Spruce, naming his Ecuador plants; Signor Beccari, preparing for a botanical exploration of Borneo; Dr. Masters, F.L.S., preparing the *Malvaceæ* for the Flora of Tropical Africa; M. Bocquillon, of Paris, studying *Verbenaceæ;* M. L. Marchand, *Anacardiaceæ;* Prof. Schimper, of Strasburg, Mosses; General Von Jacobi, of Berlin, Agaves, etc.; Mr. Moggridge, Mentone plants; Mr. Edgworth, Indian plants; Rev. W. Newbould, British plants; Rev. M. J. Berkeley, Mr. Miers, etc., sundries.

The number of donors, etc., to the Herbarium has been quite unprecedented this year, amounting to upwards of eighty persons and institutions; while the number of specimens that have been received (inclusive of Burchell's and Lindley's collections) are little short of 100,000 (97,973). Of this prodigious number, a great many are duplicates, not required to be kept; but fully 20,000 are being intercalated in the general Herbarium, whilst the remainder must be arranged and ticketed for distribution. I need not add that, with the most untiring industry and energy, the officers of the Herbarium have been quite unable to overtake the current duties of the year, even with such temporary assistance as we have been able to obtain. I have, in this matter of assistance, to return especial thanks to M. Triana, of New Granada, for assistance during his visit to Kew, in arranging Burchell's Brazilian collections; to Col. Munro, C.B., for naming and arranging many collections of Grasses; to Prof. Mettenius, of Leipzig, who has undertaken the Indian Ferns; and to Mr. J. G. Baker, who has gratuitously arranged and named the Mosses, Lichens, etc., of Borrer's valuable Herbarium.

CORRESPONDENCE.

Rev. R. T. Lowe's Exploration of the Cape Verdes.

I am glad to report to you that my late two months' cruise amongst the Cape Verde Islands with my friend Mr. Gray in his yacht 'The Garland,' R.Y.S., has been most successful. I have collected upwards of 2000 specimens of from 400 to 500 species, many of which are additions to my former collection in 1864, and of which others are even more valuable in clearing away difficulties or mistakes in the lists of Cape Verde plants, already published by Webb, J. A. Schmidt, etc. A second year's experience has also enabled me to form a more matured opinion, with respect to several plants included in preceding

Floras, but which I believe to have been introduced into them merely on the strength of accidental garden specimens. And thus I have obtained materials for a nearer approximation towards an accurate Flora, distinguished into its genuine indigenous and adventitious cultivated or naturalized portions than at present we possess.

The islands visited by us were those of São Vicente, St. Antão, St. Iago, Fogo, and Brava,—by far the most important of the group in every way,—omitting that of São Nicolão, as having been explored by us two years ago, and the eastern subordinate set of Sal, Boa Vista, and Maio, as unlikely to offer much not found in the others. The autumnal rains had been unfortunately scanty, and the islands were consequently in scarcely a more favourable condition for botanical purposes than we had found them two years previously, after the great drought of 1863. I am, indeed, convinced that a continued residence throughout the whole rainy season, *i.e.* from July to November or December, is the *sine quâ non* for a really complete and satisfactory Cape Verde Flora. In grasses especially, and (as reported by a very intelligent Portuguese gentleman in the interior of St. Iago) in parasitical plants also, much doubtless remains to be discovered at such season. But at others, no very important or considerable accession to our present stock of information concerning either the general character or extent of the Cape Verde Flora can be much expected.

I have consigned also to Dr. Gray, for the Museum, some interesting fishes, *Crustacea*, etc.; and Mr. Wollaston, who accompanied us, is well satisfied with the result of his own and Mr. Gray's joint entomological researches.

R. T. LOWE.

Norton Fitzwarren, Taunton, Easter Monday, 1866.

Dr. Gibelli on Saxicolar Verrucariæ.

In the April number of the 'Journal of Botany,' you have noticed four new works on Lichens, by Professors Garovaglio and Gibelli. You state the conclusion Dr. Gibelli has arrived at, is in substance that "all the saxicolar species (*Verrucariæ*), whether with unilocular, bilocular, quadrilocular, or multilocular or muriform spores, are destitute of distinct paraphyses, and consequently hermaphrodite," *ante*, p. 126; that is to say, they have asci, spores, and spermatia in one and the same apothecium.

I don't desire to enter into controversy, but I think, for the benefit of workmen like myself in this department of botany, I ought to state that two saxicolar *Verrucariæ*, *V. hydrela*, Ach. (Ben Nevis), and *V. mucosa*, Wallbg. (N.E. coast of Ireland), which happen to be on my table at this moment, both possess entire spores, are destitute of paraphyses, and, according to the rule, ought to be hermaphrodite. They do, however, both possess abundantly spermagonia in distinct and separate receptacles as well as apothecia, containing asci and spores, and are consequently according to Professor Gibelli's rule diclinous

THEOBALD JONES.

18, *Harcourt Street, Dublin, April* 9, 1866.

BOTANICAL NEWS.

Botanical Society of Edinburgh.—February 9. Professor Archer in the chair.—The following communications were read:—I. On Diseases of Plants in connection with Epidemics in Man and Animals. By Dr. W. Lauder Lindsay. The author states that he is desirous of drawing attention to blights and other diseases of plants, especially food plants, as coincident with epizootic diseases or cholera. The history of epidemiology shows that the epidemic diseases of plants frequently precede or are contemporaneous with those of man and animals; and the inference seems legitimate that they are in such cases equally attributable to the action of that mysterious atmospheric poison which apparently generates such diseases as cholera and rinderpest. So early as the Middle Ages this coincidence appears to have been recognized. Dr. Chambers remarks: "While there are several instances of famine not followed by the pest, there was scarcely an instance of the pest which was not immediately preceded by a famine. So far, the opinions of modern medical writers, that deficient nutrition in the community is one of the predisposing causes of pestilential fevers, may be considered as made out by facts." Hecker mentions that various epidemics of the Middle Ages were ushered in by the prevalence of certain moulds, such as red fungi, which were frequently regarded as blood-spots, and as an indication of the coming pestilence. The connection of fungi with epidemics in man, animals, and plants is a theory which has found favour from the Middle Ages to the present day. Dr. Lindsay then alluded to the blighting of plants in several instances of epidemics, and concluded by calling the attention of botanical observers to the diseases of plants, with the view of observing their connection with germs of fungi, etc. in the atmosphere, and of devising methods of destroying them. II. Notes on a Botanical Tour through Canada in 1865. By Mr. R. M. Stark. III. Notice of a Tree found in a Peat Moss in the Island of Shapinshay, Orkney. By Mr. Alexander Buchan. IV. On the Development of Leaves. By Mr. William R. M'Nab. In this paper the author gives details of the development of the different parts of leaves, and showed that all the various leaf-forms could be reduced to seven types. In five the edge only of the epiphyll developed the laminar part, in the other two the inner side also assisted. The first five are:—1. Basifugal type; the leaflets, or parts of the leaf appearing, basal part first, apex last, as in many of the *Leguminosæ*. 2. Basipetal, the apex developing first, base last, as in many *Rosaceæ*, and in most Monocotyledons. 3. Divergent type, the central parts developing first, and the apical and basal last, as in *Achillea*, etc. 4. Simultaneous type, all the parts appearing simultaneously from base to apex, as in many Palms. 5. Ternate type, central parts appearing at first, which develop two pinnules at each side of the primary parts, as in most of the *Ranunculaceæ*. The two in which the inner side takes part in the development are:—6. Cyclical type; the laminar part surrounds the epiphyll, as in peltate leaves, the Lupine, etc. 7. Parallel type; parallel rows of leaflets appear on epiphyll, as in *Fœniculum*, etc. To all those types both simple and compound leaves belong, the difference being one of degree of development, not one of type. The author

concluded by examining some of the different forms of stipules. V. Report on the Flowering of Plants in the Open Air at the Royal Botanic Garden. By Mr. M'Nab.

March 8. Dr. Alexander Dickson in the chair.—The following communications were read:—I. Notice of the Plantations of Cinchona at Darjeeling. By Dr. Thomas Anderson, Calcutta. Dr. Anderson states that plantations of Cinchona have been formed at Darjeeling at five elevations, viz. 5321 feet, 5000 feet, 4410 feet, 3332 feet, and 2256 feet above the level of the sea; and that the number of Cinchona plants in these plantations on 1st November, 1865, were:—*C. succirubra*, 43,134; *C. Calisaya*, 142; *C. micrantha*, 4264; *C. officinalis* (including vars.), 56,330; *C. Pahudiana*, 5092—total, 108,962. II. Notes of a Botanical Tour through the United States in 1865. By Mr. R. M. Stark. III. Report on the Flowering of Plants in the Open Air at the Royal Botanic Garden. By Mr. M'Nab. IV. Dr. Carrington presented specimens of *Scapania Bartlingii*, Nees—a species new to Britain.

April 12th. Dr. Greville, President, in the chair.—The following communications were read:—I. On the Ravages of Insects on Forest Trees. By Prof. Archer. The most serious of these insect enemies are,—1. On the Elm, *Scolytus destructor*, *S. pygmæus*, *S. multistriatus*, *Hylesinus varius*, *Saperda punctata*, *S. carcharias*, *Zeuzera æsculi*, and *Cossus ligniperda*. 2. The Oak, *Scolytus multistriatus*, *S. intricatus*, *Clytus arcuatus*, *Cerambyx heros*, etc. 3. The Ash, *Hylesinus fraxini*, *H. crenatus*, etc. 4. Coniferæ, *Scolytus pini*, etc. 5. The Apple and Plum, *Scolytus pruni*. 6. The Acacia, *Clytus nugiticus*, etc. 7. The Birch, *Scolytus betulæ*. The author explained the best means for destroying these pests by gas tar. II. On the Production of Alcohol and Paper from Wood. By M. Colladon. III. Notice of Fungi collected near Bridge of Earn, Perthshire, in September, 1865. By Mr. John Sadler. IV. List of Marine Algæ collected in Otago, New Zealand. By Dr. W. Lauder Lindsay. V. On a new Species of *Melanospora* from Otago, New Zealand. By Dr. W. Lauder Lindsay. VI. On the Movement of Sap in the Shell-bark Hickory. By John Townley, Esq., Wisconsin, U.S.; communicated by Professor Balfour. Mr. Townley's communication had reference to the exudation of sap from the trunks of Hickory trees after they had been cut down. He alluded particularly to the occurrence of this even during intense frost. VII. Report on the Flowering of Plants in the Open Air at the Royal Botanic Garden. By Mr. M'Nab.

Mr. James Britten is publishing in 'The Naturalist' what appears to be a carefully executed Flora of High Wycombe, Buckinghamshire.

We have seen the first two sheets of the new work by Dr. Moore and A. G. More, 'The Contributions to a *Cybele Hibernica*.' It promises to be a carefully prepared volume, and it will certainly be a great addition to our knowledge of Irish plants.

ERRATUM.—Page 121, line 11 from bottom of page, *for* "None of the species are given," *read* "Some of the species are not given."

PIPERACEÆ NOVÆ.

Auctore CASIMIR DE CANDOLLE.

(*Continued from page* 147.)

TRIB. II. *PIPEREÆ.*

Genus PIPER.

Subgen. I. PIPEROIDES.—*Antheræ mat. bivalvæ. Plantæ monoicæ.*

P. petiolatum; foliis longe petiolatis ovato-acuminatis vel ovato-oblongo-acuminatis basi æqualiter rotundatis utrinque glabris siccis membranaceis 5-quintuplinerviis, amento masc. florenti quam pedunculus multum breviori, antheris mat. globosis bivalvis, stirpis femin. baccis subglobosis.—In Mont. Khasia (Herb. Ind. Or. Hook. et Thoms. Herb. Kew.) et Bengalia orient. (Griffith, n. 4410 et 4405, Herb. East Ind. Comp. in Herb. Kew.).—Stirpis Khasianæ ramuli glabri, nodi vix tumiduli, foliorum limbi 0,12 longi 0,07 lati, petioli 0,02–0,06 longi.

Subgen. II. EUPIPER.—*Antheræ mat. quadrivalvæ.*

Sect. I. BRACHYSTACHYS.—*Stigmata* 2.

§ 1. *Stigmata 2, lateralia.*

P. arthantopse; foliis petiolatis ovato-lanceatis apice acuminatis acutis basi æqualiter rotundatis breviter cordulatis utrinque glabris siccis membranaceis vel rigidulo-membranaceis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{2}{3}$ alt. nervos alt. 5 subadscendentes mittente, amento folio multotics breviori cylindrico apice mucronato, bractea cucullo subcupulæformi vertice apice inflexo peltam triangular. simulanti intus pubescenti, stam. 4, antheris caducis, filamentis ad medium ovarii epigynis, ovario immerso cum rachi coalito apice in stylum carnosum attenuato, baccis coalitis.—In Costa Rica ad Aguacate (Hoffmann, n. 576 et 589, Herb. Ber.).—Frutex 1–2-pedalis (Hoffm. l. c.), nodi vix tumiduli, ramuli glabri, foliorum limbi 0,17–0,19 longi 0,06–0,08 lati, petioli 0,01 longi.

P. singulare; foliis petiolatis ovato-ellipticis apice acuminatis acutis basi æqualiter acutiusculis utrinque glabris siccis rigidulis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{2}{3}$ alt. nervos 5 alternos sub-

adscendentes mittente, amento quam folium multoties breviori mucronato, bractea spathulata basi puberula, vertice nudo inflexo, dorso carnosulo peltam triangularem simulanti, stam. 4, antheris longiuscule articulatis, connectivo supra loculos producto, stylo ovarium superanti, stigmat. 2 later.—In Nova-Granata (Triana, n. 361).—Frutex, ramuli glabri, nodi tumiduli, foliorum limbi 0,105 longi 0,08 lati, petioli 0,022 longi.

§ 2. *Stigmata* 2, *rachi opposita.*

* *Stamen unicum; vegetatio ad quemvis nodum interrupta.*

P. Sagoti; foliis subsessilibus oblongo-ellipticis apice acuminatis acutis basi inæqualiter subattenuatis obtusiusculis utrinque glabris siccis membranaceis centrali nervo ad apicem ducto utrinque ad apicem nervos venasque fortiores alternos patulo-adscendentes 13–15 mittente, amentis unisexualibus, masculis subglobosis, floris masc. bractea spathulata sessili brevi, stam. 1 oblongo, filamento anther. mult. superanti supra loculos producto, amenti fem. cylindricis, floris fem. bractea lanceolata basi cuneata extus puberula, ovario globoso.—In Guyana Gallica. Maroni (Herb. Sagot, 1255, Herb. Kew.).—Ramuli glabri, nodi haud tumidi, foliorum limbi 0,05 longi 0,02 lati.

Sect. II. MACROSTACHYS.—*Stigmata* 3–4–*plura.*

A. *Vegetatio continua; amenta axillaria.*

a. Flores hermaphroditi.

P. pedunculatum; foliis longiuscule petiolatis late ellipticis apice subattenuatis basi inæqualiter subattenuatis acutiusculis supra glabris subtus ad nervos puberulis siccis rigidulis opacis, centrali nervo utrinque ad $\frac{1}{2}$ alt. nervos alternos 6 subadscendentes supremos ad apicem fere ductos mittente, petiolo alato glabro, alis ad limbum ductis, pedunculo petiolum fere duplo superanti appresse puberulo, amento mucronato folio multum breviori axillari solitario, bracteæ truncato-peltatæ pelta triangulari margine hirtella, bacca obovato-trigona glabra, stig. 3, stam. haud reperi.—In Nova-Granata (Triana, Exsic. sine num. Herb. Cand.).—Frutex, ramuli teretes glabri, foliorum limbi 0,135 longi 0,075 lati, petioli 0,03 longi, amenta mat. 0,004 crassa.

P. Trianæ; foliis longe petiolatis subrotundatis subobovatisve apice breviter acuminatis acutis basi subinæqualiter rotundato-cordatis utrinque glabris siccis membranaceis, centrali nervo ad apicem ducto utrin-

que ad $\frac{1}{2}$ alt. nervos alternos 7–8 subadscendentes supremos ad apicem ductos mittente, petiolo glabro ad $\frac{1}{2}$ longit. alato, alis linearibus pacia liberis, amento solitario apice ramuli axillaris bracteola lanceolata fulto quam folium multoties breviori, bractea vertice truncato-peltata nuda, pedicello cucullato, stam. 2 later. antheris deciduis, ovario apice in stylum longum attenuato, stigmat. 3, bacca ovata.—In Novæ-Granatæ prov. de Pasto alt. 2500 ped. (Triana, n. 2, Herb. Cand.)—Frutex, ramuli glabri, nodi haud tumiduli, foliorum limbi 0,16 longi 0,12 lati, petioli 0,065 longi.

B. *Vegetatio ad quemque nodum interrupta; amenta oppositifolia.*

§ 2. *Stam.* 2–3.

a. Ovarium in stylum elongatum.

P. Quitense; foliis breviter petiolatis lanceolatis apice acutis mucronulatis basi acutis utrinque glabris siccis membranaceis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{3}$ alt. nervos duo alternos subadscendentes mittente, pedunculo petiolum multum superanti, bractea lanceolata apice acuta dorso gibbosa unde vertice inflexo subpeltata glabra, stam. 3 raro 4, ovario in stylum longum attenuatum stigmat. 3 carnosula imo apice gerenti.—In sylvis umbrosis prov. Pastoensis Andium Quitensium alt. 8000 ped. (Jameson, n. 414, Herb. Kew.).—Ramuli teretes glabri, nodi tumidi, foliorum limbi 0,075 longi 0,03 lati, petioli 0,003 longi.

P. Cubense; foliis breviter petiolatis oblongo-ellipticis apice attenuatis acutiusculis basi attenuatis acutis supra glabris subtus ad nervos puberulis siccis firmo-membranaceis opacis 5-nerviis, pedunculo petiolum multum superanti hirtello, rachi hirtella, bractea ovato-lanceolata sessili glabra, stam. 3, antheris subsessilibus, ovario oblongo apice in stylum subtetragonum producto, stigm. discoideo apice styli sessili. —In insula Cuba (Wright, n. 513, Herb. Boiss.).—Ramuli puberuli teretiusculi, foliorum limbi 0,06 longi 0,025 lati, petioli 0,003, pedunculi 0,03 longi.

P. Birmanicum; foliis breviter petiolatis oblongis apice attenuatis acutiusculis vel e basi cuneata obovatis apice breviter attenuatis acutis supra glabris subtus ad nervos puberulis siccis membranaceis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{3}$ alt. nervos 3 suboppositos subadscendentes mittente, petiolo hirsuto, pedunculo hirsuto petiolum superanti, bractea rotundato-peltata sessili centro affixa, stam. 2 interdum 3, ovario oblongo in stylum brevem attenuato, stigmat. 3 re-

curvis, bacca subglobosa cuspidata.—In peninsula Birmanica prope Malacca (Griffith, n. 4414, Herb. Kew.).—Ramuli teretes apice ochraceo hirsuti, nodi tumiduli, foliorum limbi 0,1 longi 0,07 lati, petioli 0,05 longi, amenta mat. 0,025 longa.

α. amentis 0,1 longis, foliis 0,2 longis 0,09 latis.—Prope Malacca (Griffith, l. c. n. 4408 et 4406).

b. Stylus nullus.

1. *Baccæ sessiles.*

P. pedicellatum; foliis breviter petiolatis ovatis vel elliptico-ovatis apice acuminatis acutiusculis mucronulatisque basi æqualiter rotundatis obtusisve vel subattenuatis obtusiusculis utrinque glabris siccis membranaceis, nervo centrali ad apicem ducto ad $\frac{1}{3}$ alt. nervos utrinque 4 subalternos 3 infer. fere e basi ortos mittente, pedunculo petiolum duplo superanti, amentis masc. gracilibus folia superant., femineis mat. folia æquantibus subæquantibusve, floris masc. bractea rotundato-peltata longiuscule pedicellata, stam. 2, bacca obovato-subtetragona.—In Sikhim (Hook. et Thoms. Herb. Ind. Or. mar. et fem. Herb. Cand.), et Bengalia orient. (Griffith, n. 4404 et 4418, Herb. Kew.).—Dioica, ramuli subtetragoni glabri, nodi vix tumiduli, foliorum limbi 0,07–0,13 longi 0,04–0,06 lati, petioli 0,005 longi.

P. Seemannianum; foliis oblongo-ovatis apice acuminatis acutis basi inæqualiter rotundatis subattenuatisve utrinque glabris siccis rigidis, nervo centrali ad apicem ducto utrinque ad $\frac{1}{3}$–$\frac{2}{3}$ alt. nervos alternos venasque fortiores fere ad apicem mittente, pedunculo petiolum paulum superanti, floris masc. bractea rotundato-peltata pedicellata, stam. 2.—In Nova-Irlandia (Barclay, n. 3515, Herb. Brit. Mus.).—Dioica, ramuli glabri teretiusculi, nodi tumiduli, foliorum limbi 0,18 longi 0,09 lati, petioli 0,01 longi.

P. Boivini; foliis breviter petiolatis ovato-lanceolatis apice acuminatis acutis mucronulatisve basi æqualiter rotundatis truncatisve utrinque glabris siccis membranaceo-rigidulis 5–7-nerviis pedunculo petiolum æquanti, ament. masc. quam folium breviori., floris masc. bractea rotundato-peltata breviter pedicellata, stam. 2.—In ins. Mohely (Boivin, Herb. Brit. Mus.).—Dioica, ramuli teretes glabri, nodi tumiduli, foliorum limbi 0,08 longi 0,05 lati, petioli 0,006–0,007 longi.

P. Lessertianum; foliis subsessilibus oblongo-ovato-ellipticis apice longe acuminatis acutiusculis basi valde inæqualiter cordatis latere

minori attenuato majori auriculiformi utrinque glabris siccis rigidis septupli-novenonerviis, centrali nervo ad apicem ducto utrinque parum supra basin nervos 2 adscendentes mittente, lateralibus nervis e basi ortis, pedunculo petiolum multoties superanti, floris fem. bractea rotundato-peltata pedicellata, stam. 2.—In insul. Philippin. (Cuming, n. 1342, Herb. Brit. Mus.).—Dioica, frutex, ramuli teretiusculi pilosi, nodi tumidi, foliorum limbi 0,2 longi 0,08 lati, petioli 0,005 longi.

P. androgynum; foliis longiuscule petiolatis ovatis apice attenuatis acutis basi æqualiter subcordatis supra subtiliter hirtellis subtus ad nervos et venas appresse hirtellis siccis rigidis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{2}$ alt. nervos alternos 8–9 subpatulo-adscendentes mittente, petiolo fusce hirtello, amento androgyno filiformi apice masculo basi femineo, pedunculo fusce hirtello quam petiolus multot. breviori, bractea rotundato-peltata brevissime pedicellata margine subtusque ciliata, stam. 2, ovar. subovato, stigmat. 3 brevibus. —In Novæ-Granatæ prov. de Pasto, alt. 2600 (Triana, n. 51).—Monoica, frutex, foliorum limbi 0,12 longi 0,09 lati, petioli 0,05 longi.

P. subulatum; foliis brevissime petiolatis ample ovatis apice acuminatis longe subulatis basi brevissime inæqualiter cordulatis supra parce pilosis subtus densius ad nervos præsertim fusce pilosis siccis firmulo-membranaceis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{3}$ alt. nervos 7–8 subadscendentes mittente, petiolo dense fusce villoso, maris stirp. bractea conico-lanceolata carnosa apice acutiuscula appresse hirtella, rachi villosula, stam. 3 duobus lateral. uno postico, antheris articulatis, connectivo supra loculos apiculato.—In Novæ-Granatæ prov. Barbacoas, alt. 50 m. (Triana, n. 18, Herb. Cand.).—Planta dioica, frutex ?, ramuli dense fusce villosi, nodi tumiduli, foliorum limbi 0,3 longi 0,03 lati, petioli 0,01 longi.

P. bullosum; foliis brevissime petiolatis ovato-acuminatis apice longe cuspidatis basi parum inæqualiter cordulatis supra glabris reticulato-bullatis subtus fusce villosis siccis subcoriaceis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{2}$ alt. nervos 6 subalternos subadscendentes mittente, petiolo fusce villoso, maris stirp. bractea conico-lanceolata glabra apice uncinato-acutata stam. 3 duobus lat. uno postico, connectivo supra loculos producto.—In Novæ-Granatæ prov. Barbacoas, alt. 1000 m. (Triana, n. 22, Herb. Cand.).—Planta dioica, frutex, ramuli juniores fusce villosi, nodi tumidi, foliorum limbi 0,18 longi 0,085 lati, petioli 0,01 longi.

2. *Baccæ pedicellatæ.*

P. Griffithii; foliis breviter petiolatis ovatis vel ovato-ellipticis apice protracto-acuminatis acutis basi obtusis vel subattenuatis acutiusculis utrinque glabris siccis rigidulis 5-nerviis vel quintuplinerviis, petiolo glabro, amento folium 3-superanti, stirp. fem. bacca globosa, pedicello breviori.—In Bengalia orientali (Griffith, n. 4402, Herb. Kew.).—Planta dioica, ramuli glabri, nodi tumiduli, foliorum limbi 0,12 longi 0,07 lati, petioli 0,01 longi, amenta mat. 0,19 longa.

P. vestitum; foliis petiolatis ovato-rotundis apice breviter protracto-attenuatis basi cordatis siccis membranaceis utrinque dense pilosis, nervo centrali ad apicem ducto utrinque ad $\frac{1}{2}$ fere alt. nervos 6 oppositos subadscendentes mittente, stirp. masc. bractea triangulari-rotunda glabra, pedicellata, stam. 2, antheris subsessilibus stirp. fem. bacca polygono-globosa.—In Costa septem ins. Borneo (Lobb, Herb. Kew.).—Foliorum limbi 0,25 longi 0,02 lati, petioli 0,07 longi.

P. Leonense; foliis brevissime petiolatis oblongis apice longiuscule acuminatis basi æqualiter cuneatis utrinque glabris siccis coriaceis trinerviis, amento quam folium breviori pedunculo petiolum multum superanti, stirp. fem. bacca globosa, quam pedicellum subbreviori.—In Sierra Leone (Afzelius, Herb. Reg. Ber.).—Planta dioica, frutex?, glabri, ramuli nodi tumiduli, foliorum limbi 0,095 longi 0,025 lati, petioli 0,005 longi.

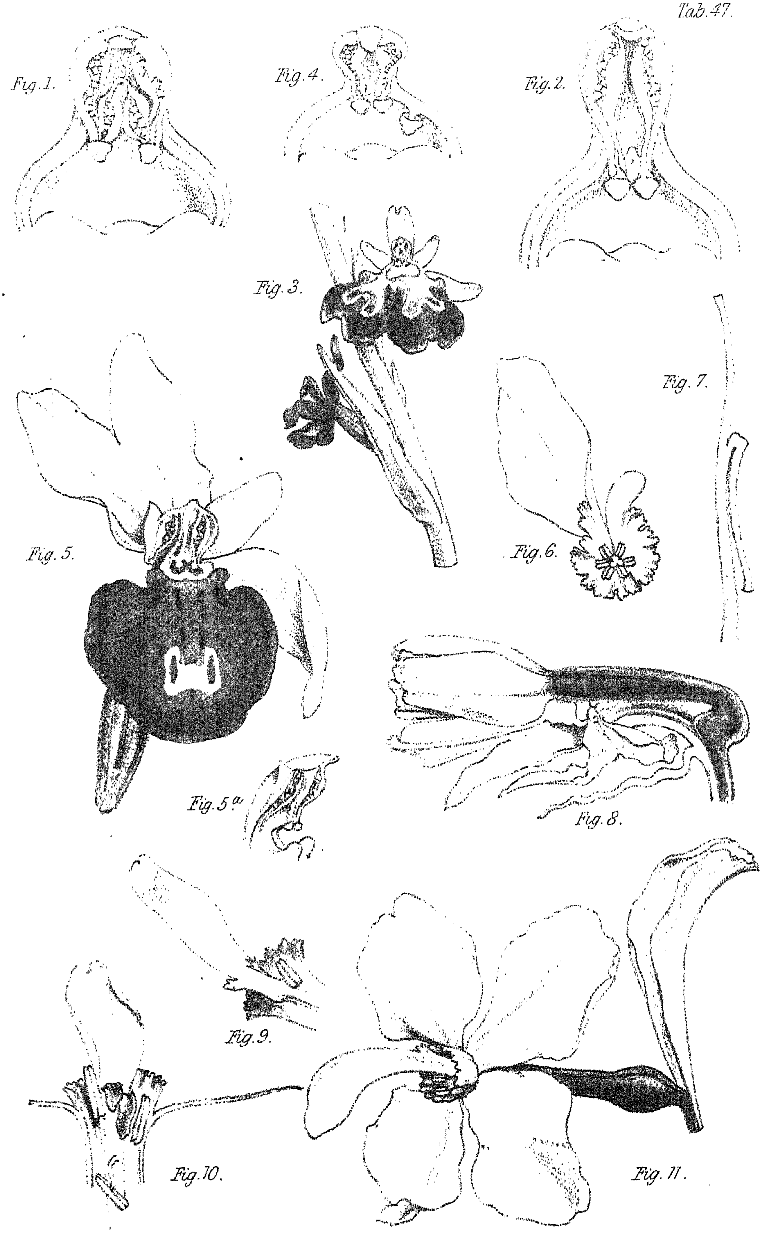
§ 3. *Stam.* 3–4–6.

a. Stigmat. 3; *stam.* 4.

1. *Ovarium in stylum elongatum.*

P. ovale; foliis petiolatis ovato-ellipticis apice acuminatis basi subæqualiter obtusis utrinque glabris siccis firmo-membranaceis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{2}$ alt. nervos 6 alternos subadscendentes supremos fere ad apicem ductos mittente, petiolo glabro ad $\frac{2}{3}$ longit. alato alis cito deciduis, amento cylindrico densifloro quam folium dimidio breviori bractea cucullata peltata, extus ochraceo-pubescenti, stam. 4, ovario ovato-globoso apice in stylum ovarium subæquantem attenuato stigmat. 3 recurvis lineari-lanceolatis, bacca globosa nigra apice mucronata.—In Venezuela prope coloniam Tovar, alt. 4000 (Fendler, n. 2398, Herb. Cand.), et Novæ-Granatæ prov. Barbacoas, alt. 200 (Triana, n. 19).—Frutex?, ramuli glabri, nodi tumidi, foliorum limbi 0,17 longi 0,09 lati, petioli 0,015 longi.

Tab. 47.



W.G. Smith, del. et lith.

Vincent Brooks, Imp

P. propinquum; foliis longiuscule petiolatis suboblongo-ellipticis apice acuminatis acutis basin versus subattenuatis basi ima acutis utrinque glabris siccis firmule membranaceis, centrali nervo ad apicem ducto nervos utrinque ad $\frac{1}{2}$ alt. nervos 5 subalternos subadscendentes supremos ad apicem ductos mittente, petiolo glabro ad limbum alato, alis cito deciduis, amento quam folium $\frac{1}{2}$ breviori, bractea cucullata extus ochraceo-pubescenti, stam. 4, ovario ovato-globoso apice in stylum ovarium fere æquanti attenuato, stigmat. 3 lineari-lanceol. recurvis, bacca nigra globosa mucronata.—In Peruvia orient. prope Tarapoto (Spruce, n. 4032, Herb. Cand.).—Frutex, ramuli glabri, foliorum limbi 0,135 longi 0,065 lati, petioli 0,022 longi.

2. *Stylus nullus; antheræ articulatæ.*

* *Bractea rotundato-peltata subsessilis.*

P. lenticellosum; foliis breviter petiolatis oblongis apice acuminatis acutis basi æqualiter subattenuatis acutiusculis utrinque glabris siccis coriaceis opacis, centrali nervo ad apicem ducto ad $\frac{1}{3}$ alt. nervos utrinque 4 alternos subadscendentes supremos ad apicem ductos mittente, pedunculo petiolum æquanti, bracteæ pelta rotunda subsessili glabra, rachi foveolata, foveolis margine ciliolatis, bacca obovato-trigona vertice subtilissime puberula.—In Novæ-Granatæ prov. Barbacoas, alt. 710 (Triana, n. 3, Herb. Cand.), et prov. Cauca, alt. 1000 (Triana, n. 29).—Frutex, ramuli lenticellosi glabri, foliorum limbi 0,115 longi 0,04 lati, petioli 0,005 longi.

(*To be concluded in next Number.*)

MONSTROSITIES IN *OPHRYS INSECTIFERA*, *Linn.*

BY J. TRAHERNE MOGGRIDGE, ESQ.

(PLATE XLVII. FIG. 1–5.)

While making a series of observations at Mentone, in south France, on varieties intermediate between *Ophrys aranifera* and *apifera*, Huds., which form part of the group united by Linnæus in his species *O. insectifera*, I met with some markedly aberrant or monstrous specimens. The forms commonly included under the title of Spider Orchids are most abundant at Mentone, and it is from among individuals of this variety that the specimens figured were selected.

Fig. 1 and 2 represent the anther and stigmatic chamber of two flowers taken from the same spike, considerably magnified. They show the rostellate process present in this plant, but converted (Fig. 1) into a miniature anther, in which the pollen masses, though devoid of caudicles, are composed of healthy-looking granules connected by elastic threads in the usual manner.

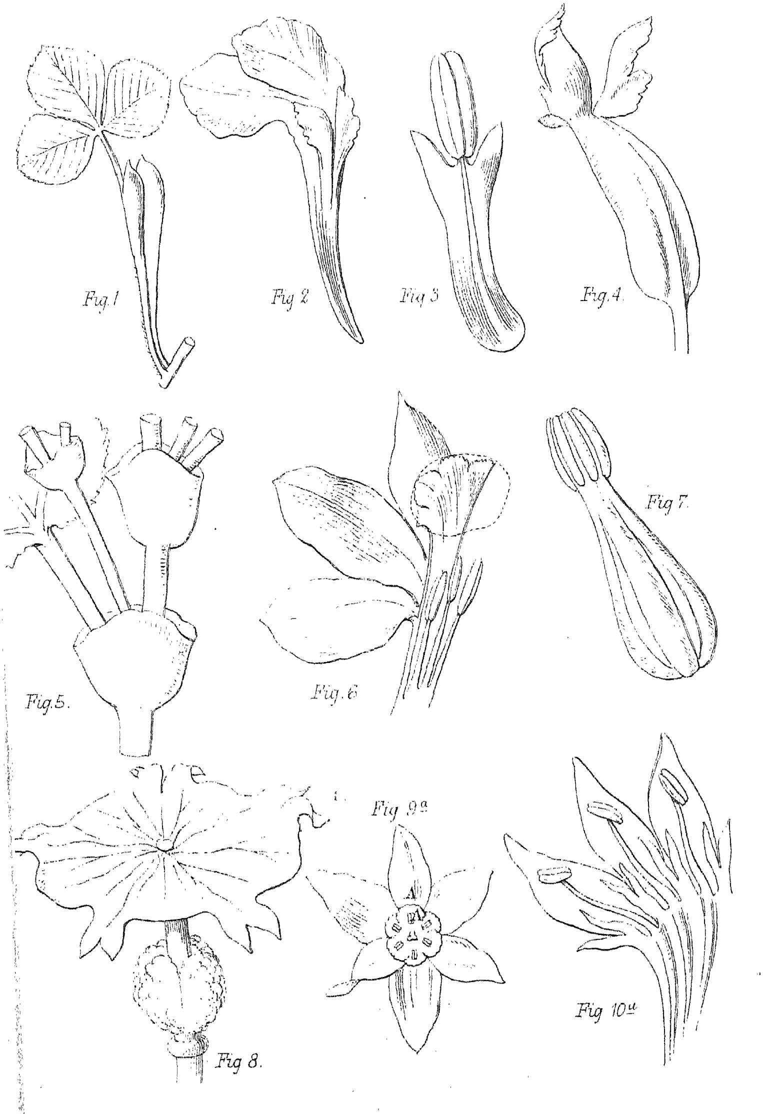
Babington has (Man. of Brit. Bot. p. 305) divided *Orchis*, *Gymnadenia*, and *Aceras*, from *Habenaria*, *Ophrys*, and *Herminium*, by the presence of the rostellate process in the former, and its absence in the latter section. However, this process may be occasionally found as in the present instance, in monstrous specimens of the genus *Ophrys*, though in the normal form it is absent.

At Fig. 3 I have given an instance of the production of two perfect labellums in a flower, the remaining divisions of which are of the usual form and number.

At Fig. 4 the anther and stigmatic cavity of a flower is represented, exhibiting a curious case in which a third rostellum is produced. This feature has a peculiar interest, as the point at which the rostellum is placed corresponds exactly with the situation of one of the two lateral glandular processes which are so generally present in Orchids, and which represent, in a rudimentary condition, the anthers found in *Cypripedium*.

[To these observations and illustrations we have added the following from Mr. W. G. Smith.—Ed.]

Fig. 5 shows an abnormal growth of the same species (*O. aranifera*). 1st. Two of the sepals are confluent. 2nd. There is great interest attached to the left-hand petal, as it is confluent with, and forms part of, a second imperfectly-developed column, and bears an anther-cell and pollen-mass (better seen in the side view, fig. 5 *a*). The true column only bears one anther-cell and pollen-mass, the other being abortive, but leaving a trace of its presence and position.



W.G Smith, del

Vincent Brooks, Imp

THE CORONA OF NARCISSUS.

By W. G. Smith, Esq.

(Plate XLVII. Fig. 6–11, and Plate XLVIII.)

Many of the most complex and intricate questions in botanical science admit of a clear and simple explanation when once the structure and functions of the plants in question are fully and distinctly comprehended. However difficult and involved the organography of some plants may at first appear, it is not often that the solution of the difficulty is as perplex as the apparent enigmatic growth would warrant, and, on the other hand, a very simple exposition will frequently make quite clear what was before abstruse and difficult to understand.

The family *Amaryllidaceæ* contains about 110 genera; of these, about 42 genera only are distinguished by the presence of a corona, whilst all, without exception, have the permanent and unchanging characters of 6 perianthal segments and 6 stamens.

It is therefore reasonable to suppose that as the corona is only present in the smaller part of the family, it is in no way *typical*, but is probably some appendage of the other organs, for the 6 segments of the perianth and the 6 stamens are constant.

This leads me to the conclusion that the attempts to account for the presence of the corona by a duplication or triplication of the perianthal segments, or an imperfect condition of an additional series of stamens or two series, is indefensible; for there is as much reason to suppose the corona an abnormal growth of an additional series of segments of the perianth when it is *petal-like* (Plate XLVII. fig. 6, 9, 10), as it is to suppose it an abnormal condition of another series of stamens, or two series, when it bears anthers; but it is far .ore reasonable to suppose it is *neither*, when it can be shown that the corona may exist without encroaching upon or altering the permanent family-characters of "6 stamens and 6 divisions to the perianth."

The transition of the leaf to the sepal, the sepal to the petal, the petal to the stamen, and the stamen to the pistil, has often been remarked, and is well known, but no attention has been paid to the metamorphoses of the *leaf-stipule;* this is not often valuable as a generic distinction, but upon the observation of its occurrence or non-occurrence in some plants I am led to found my hypothesis.

That these appendages are sometimes present in all the floral organs of plants seems to me clear from Figs. 1, 2, 3, and 4, Plate XLVIII. The leaf-stipules of *Trifolium incarnatum* (Fig. 1) are almost repeated, with the exception of colour, in the petals of *Silene maritima* (Fig. 2); there is such a close resemblance in form and position in both objects, that it is impossible to doubt their being identical in character. A slightly modified form of stipule exists in the stamen of *Ornithogalum nutans* (Fig. 3); and they are very distinct and most characteristic in the stigma of *Iris Pseudacorus* (Fig. 4). If reference is made to Fig. 2, and if the whole of the petal-stipules of the complete flower are imagined to be *connate*, we have a corona precisely resembling *Narcissus*.

The true explanation of the corona in the small section of the Order, I believe, consists in the recognition of a series of confluent petal-stipules, leaving the normal 6 stamens and 6 petals as in the rest of the *Amaryllidaceæ*. That there is nothing improbable in confluent stipules, I give examples of them in all the floral organs; Fig. 5 is an example of confluent leaf-stipules in *Græffia calyculata*, figured in Seemann's 'Flora Vitiensis,' plate vi. (a somewhat analogous growth may be seen in many of the *Euphorbiaceæ*). Fig. 6 is one-half a flower of *Narcissus Pseudo-narcissus*, shown with half the corona, *i. e.* half the series of confluent petal-stipules. If this figure be compared with Fig. 2, where the stipules are disconnected, it will be better understood. Fig. 7 shows the stamens of *Lobelia Dortmanni*, confluent near the anthers, but free below; if we imagine the two appendages of Fig. 3 to be connate, we would have such a growth as is here represented, with the filaments disconnected below. Fig. 8 gives an example of confluent pistil-stipules in *Sarracenia purpurea*, and may be compared with the stigma of *Iris* in Fig. 4, where, if we imagine the appendages to be connected, we have an object similar to that represented in Fig. 8.

In *Pancratium Illyricum* (Fig. 10 *a*) the confluent stipules are attached to the filaments, instead of to the corresponding parts of the perianth segments, as in *Ornithogalum nutans*, only that they are connate.

Dr. Masters, in Journ. Bot. Vol. III. p. 107, endeavours to show that the corona probably "consists intrinsically of two rows of stamens." He says, "in the species with lobed cups three of the lobes are opposite to the sepals and alternate with the petals (A. A. Fig. 9 *a*), and these three in æstivation decidedly overlap the three inner lobes which are

opposite to the petals and alternate with the outer row of stamens," etc. etc.

This is to me only another proof of the stipule nature of the corona, for if it be considered as an appendage of overlapping sepals and petals, the appendages would naturally overlap in a similar manner, as we really find it here, the outer segment of corona belonging to the outer segment of perianth, and the inner to the inner. The same author's observations regarding the not uncommon occurrence of the coronal segments distinct and separate from each other only reverts the corona to the somewhat more remote type of Fig. 2, with disconnected stipules.

It may be objected that stipules of no sort form any character of the Natural Order *Amaryllidaceæ*, but the answer to this is, that stipules have little or no value as a family character, as in *Hederaceæ* (or *Araliaceæ*) stipules are present in some genera and absent in others; this I consider as exactly equivalent to the presence or absence of the corona in the genera of *Amaryllidaceæ*. That the abnormal growths of the corona of *Narcissus* sometimes more nearly approach the true form of stipules may be seen in Fig. 9, drawn from abnormal growths of the plant I have recently observed.

The scales of *Cuscuta* and other appendages in corolla-tubes may have a similar origin to the corona of *Narcissus*.

STIRPIUM NOVARUM TETRAS.

Auctore HENR. F. HANCE, PH.D., SOC. REG. BOT. RATISB. SODALI, CÆT.

1. *Gymnosporia Harlandi*, n. sp.; erecta, robusta; cortice purpurascenti, foliis alternis rigide coriaceis glaberrimis siccitate glaucescentibus ovali-oblongis obtusis margine obsolete crenulatis basi in petiolum brevem late cuneatis penninerviis nervis utrinque leviter prominulis, spinis validis axillaribus curvulis petioli circ. longitudine, staminibus sub fructu superstitibus, capsulis circiter 6-nis pedunculis iis subæquilongis suffultis supra spinas in fasciculos umbelliformes foliis 5-plo breviores e nodis squamulosis (fere uti in *Caraganis* nonnullis) ortis dispositis subturbinatis opacis semipollicaribus trigonis trilocularibus valvis medio sulcatis, seminibus in loculis binis oblongis basi tantum arillo cinctis.

Ad sinum Turon Cochinchinensium, a. 1855, legit beatus *Dr. Harland.*

Folia 4–5 poll. longa, incl. petiolo 5-lineali, 2–2½ poll. lata. Capsula vix Avellanæ mole, angulis apice rotundatis.

2. *Aralia Planchoniana*, n. sp.; frutex erectus, circ. 12-pedalis, caule aculeato, ramulis petiolis foliorum pagina inferiore inflorescentiaque tomento fulvo-flaventi obtectis, foliis bipinnatis 4-jugis foliolis 4–5-jugis cum impari mollibus brevissime petiolulatis sursum vix decrescentibus ovatis subcaudato-acuminatis margine crebre at inconspicue denticulatis costato-nervosis, nervis subtus prominulis luci obversis examinatis subtiliter venulosis supra rugulosis ac sparse fusco-hirsutulis, petiolo communi deorsum sparsissime aculeolato, pinnis basi foliolis binis deorsum spectantibus instructis ac linea aculeata elevata connexis, paniculis axillaribus et terminalibus foliis brevioribus ramis plerumque iterum ramulosis basi et ad insertionem ramulorum bracteis scariosis suffultis umbellis multi-(25–30-)floris, pedicellis flore duplo fructu 3–4-plo longioribus basi scarioso-bracteatis, calyce petalisque glaberrimis, stylis 5 staminibus triplo brevioribus, fructibus obtuse pentagonis.

In fruticetis densis, præruptis, inter saxa, ins. 'Ilha Verde' Macaiensium, ipse legi, d. 18 Novembris 1865.

Foliola 2–3½ pollicaria, 1–1½ poll. lata. Pedicelli florif. 2-fructif. 4-lineales.

A. Chinensis, L.; juxta specimina Hongkongensia, primo obtutu distinguitur, inter alia, fructibus majoribus, foliolis multo minoribus, ovato-lanceolatis v. sæpe lanceolatis, teneribus, creberrime duplicato-serrulatis, infra dense spinulosis, ramisque inflorescentiæ crebre aculeatis. Hæc est, procul dubio, vera species Linnæana; nam, etsi ubique rarissima, eam inveni Whampoæ, in insula Francogallorum, ubi, ut ipse commemorat, d. 6 Octobris, 1751, ab Osbeckio reperta est, a cujus manibus verisimillimum est Linnæum specimina sua obtinuisse. Planta supra descripta multo propius appropinquat *Araliæ Decaisneanæ*, mihi (in Ann. Sc. Nat. Paris. ined.), stirpi Formosanæ, quæ vero diversa est foliolis conspicue decrescenti-pinnatis, duplo minoribus, ovalibus, grosse pauciserratis, in acumen haud productis, supra non rugulosis, firmioribus et valde opacis, ita ut, luci obversis, venularum rete nequaquam perspici potest, indumenti colore, paniculis simplicioribus, cæt. Ambas has peraffines species sacratas

volui viris doctissimis Decaisneo et Planchonio, 'pari nobili fratrum,' qui, conjunctis studiis, plura Araliacearum genera recensuerunt.

3. *Gelonium* (vel *Suregada*) *æquoreum*, n. sp.; frutex, ramis cortice griseo obductis, foliis coriaceis brevipetiolatis obovatis integerrimis margine subrevolutis penninerviis, nervis utrinque prominulis ob cuticulam inter nervillos solutam (ut videtur) ope lucis translucentis observatis quasi pellucido-punctatis et oculo nudo desuper inspectis supra quasi elevato-granulatis, floribus masculis ad petiolos 3–6 umbellato-aggregatis, pedicellis floribus æquilongis basi sæpe resinam exsudantibus, calycis flavidi phyllis obtusis cucullantibus, staminibus numerosis. Flor. fœm. ignoti.

Ad Takow, insulæ Formosæ, in aqua marina, instar *Avicenniarum* plus minus submersum, easque inter crescens, a. 1865 collegit *R. Swinhoe.*

Stirps, generis species paucissimas complectentis, vel forte hucusque potius monotypici et variabilis, ut autumat Thwaitesius, foliorum forma bene distincta, et præsertim statione singulari insignis. Folia siccitate flavescunt.

4. *Pollinia** *eriopoda*, n. sp.; radicibus fibrosis fulvo-tomentosis, culmis geniculatis cum nodis foliisque glaberrimis basi densissime cæspitosis ac lana valde copiosa griseo-cinerea in floccis facile avellenda intertextis, foliis angustis convolutis acuminatis, ligula ad pilorum fasciculum reducta, spicis terminalibus 2–4-nis exsertis vel folio supremo ampliato inclusis undique fulvo-hirsutis, rachi articulata, spiculis geminatis utraque fertili altera sessili mutica altera pedicello glaberrimo suffulta aristata, arista recta scabrida flosculo æquilonga, glumellis subglabris.

Ad Apes' Hill, insulæ Formosæ, collegit cl. *R. Swinhoe*, a. 1865.

Species distincta, ex affinitate *P. Cumingii*, Nees, et *P.* (*Erianthi*, Munr.) *velutinæ:* ob cæspites vellere denso (instar *Arnocrini* generis!) obvallatos, valde notabilis.

Scripsi Whampoæ Sinarum, ix. *Kal. Apriles*, 1866.

* Genus sensu Triniano receptum, æquipollens igitur *Eulaliæ*, Kunth. Steudelius species generum affinium male mulcavit, ac sæpius perperam locavit. Monendum etiam puto quod si notæ quibus *Pollinia*, *Eulalia*, et *Erianthus* inter se distinguuntur revera ad genera condenda sufficiant, *Imperata* (*Triarrhena*) *sacchariflora*, Maxim. (cujus pulchra specimina e ditione Pekinensi mecum communicavit amicissimus Dr. S. W. Williams), potiori fere jure genericam exposcat dignitatem. Has vero quæstiones periti judicio Munronii relinquo.

OFFICIAL REPORT ON THE BOTANICAL DEPARTMENT OF THE BRITISH MUSEUM.

By J. J. Bennett, Esq., F.R.S.

The principal business of the department during the year 1865 has consisted in the naming, arranging, and laying into the general herbarium of the extensive collections of plants of Cuba, formed by Mr. Charles Wright, and of Venezuela, formed by M. Moritz; of numerous families from the great Oriental collections of M. Aucher Eloy; of plants from Otaheite, the Fiji Archipelago, and other islands of the South Pacific; of a continuation of the Senegambian collections of Perottet, Leprieur, and of Heudelot, and of Thwaites's plants of Ceylon; of M. Giesecke's plants of Greenland; of the cellular cryptogamic plants of Mr. Cuming's Philippine collection; of *Hepaticæ*, Mosses, *Characeæ*, and *Fungi*, from various localities and collectors, and of a large number of miscellaneous additions to the collection:

In the re-arrangement, with large additions of the families of *Corylaceæ*, *Juglandeæ*, *Myriceæ*, *Platanaceæ*, and *Cupuliferæ*, and of portions of the collection of woods:

In the examination and partial arrangement of various collections recently received:

In the laying into the British Herbarium of Mr. Black's and other collections of Mosses; of Dr. Carrington's *Hepaticæ;* of numerous species from various localities and collectors, and especially of Roses, *Carices*, and Willows; and of a portion of the collection presented by Mrs. Atkins:

And in the continued re-arrangement of the British *Fungi*, with very extensive additions.

The principal additions which have been made to the department during the year 1865, consist of—

About 1500 species of plants, including a valuable British herbarium, presented by Mrs. Atkins.

Specimens of *Viola arenaria* from Yorkshire, and of *Trichomanes radicans* from Wales, presented by Mr. James Backhouse, jun.

269 species of plants of the Shetland Islands, collected by Mr. Tate.

250 „ British Fungi, from the collection of Mr. Cooke.

5 „ microscopic Fungi, presented by C. E. Broome, Esq.

80 species and varieties illustrating a 'Monograph of British *Cladoniæ*,' by Mr. Mudd.

269 species of Swedish phænogamous plants, and 100 species of Mosses, collected by M. Nyman.

200 ,, plants, forming cent. 34 and 35 of M. Billot's 'Flora Galliæ et Germaniæ Exsiccata.'

1000 ,, the Tyrol, collected by Rupert Huter and others.

100 ,, forming fasc. 23 and 24 of the 'Erbario Crittogamico Italiano.'

400 ,, the rarer plants of Sicily, forming fasc. 1–4 of Todaro's 'Flora Sicula.'

76 ,, Roses, presented by M. A. Déséglise.

273 ,, European Mosses, contained in Schimper's 'Pugillus Muscorum.'

100 ,, Fungi, forming cent. 7 of Rabenhorst's 'Fungi Europæi.'

130 ,, Algæ, forming fasc. 166–178 of Rabenhorst's 'Algæ Europææ.'

30 microscopical slides of *Diatomaceæ*.

1078 species of South African plants, collected by Mr. T. Cooper, and presented by W. W. Saunders, Esq.

1600 ,, plants from the Zulu country, South Africa, collected by Mr. W. S. Gerrard.

200 ,, plants of the islands of the South Pacific, and especially of the Fiji archipelago.

2850 ,, Venezuela, collected by M. Moritz.

2127 ,, phænogamous plants of Cuba, collected by Mr. Chas. Wright.

2000 ,, chiefly garden specimens, from the collection of Mr. John Smith.

100 ,, fruits and seeds from Mexico, collected by Mr. Farris.

An extensive and valuable series of botanical drawings and manuscripts by the late Richard Anthony Salisbury, bound in six folio volumes; presented by Dr. Gray.

Three memoirs on *Diatomaceæ*, together with thirty-one microscopic slides illustrative of the species and varieties described in them; presented by the author, Dr. F. W. Lewis.

A set of memoirs descriptive of British Fungi; presented by the author, C. E. Broome, Esq.

The 'Supplement' to his 'Cybele Britannica;' presented by H. C. Watson, Esq.

ON *AIRA ULIGINOSA* AS A BRITISH PLANT.

By J. G. Baker, Esq., F.L.S.

Aira uliginosa, a plant I have often looked for without success in the north of England, seems to have been known to some of our botanists as a native plant many years ago. The Rev. W. W. Newbould informs me that there is a specimen labelled "From near the Loch of Drum, Aberdeenshire," sent to Sowerby, and now in the British Museum Herbarium, and I have myself seen examples gathered by George Don, both at Kew (from Turner's collection), and from that of Winch, in the Museum of the Literary and Philosophical Society at Newcastle-on-Tyne. On the label of the specimen at Kew, written of course long before the plant was published as a distinct species in Germany, Don, who does not mention his locality, expresses his opinion upon the plant as follows:—"*Aira* I call in my herbarium *uliginosa*; it comes near *flexuosa*, but it differs by the smallness of its leaves and in the straightness of its leaves, and it is constitutionally different, if I may be allowed to use the expression, for it only grows under water or (in) places that are inundated in the winter season, and I have tried repeatedly to cultivate it in dry ground but could not succeed."

Undoubtedly it comes very near to *flexuosa*. The principal characters relied upon to distinguish it are three:—1st. There is in *uliginosa* a stalk to the second flower of the spikelet which equals half its length, whilst in *flexuosa* both the flowers are very nearly, or one quite and the other very nearly, sessile. 2nd. The ligule in *uliginosa* is ovate and acute, in *flexuosa* short and truncate; and, 3rd. The leaf, though very narrow in both, in *flexuosa* is said to be solid and filiform, but, in *uliginosa*, flat or only rolled together.

Weihe and Bönninghausen, in their original description (Prodr. Fl. Monast. p. 25), write of it as follows:—"Differt a præcedente, cui valde similis, foliis angustissimis planis vel complicatis, nec tereti-filiformibus solidis, ligula longe acuminata, panicula magis multiflora, spiculis duplo minoribus, glumis obtusioribus fere æqualibus, flosculis

multo minoribus, altero axi elongato dimidium flosculi inferioris æquante, nec quartam ejus partem vix attingente, insidente, valvula corollæ inferiore latiuscula; porro loco natali, temporeque florendi."

It has been adopted as a distinct species by most German authors, since 1824, including Koch (Synops. 2nd edit. p. 915), Reichenbach (Flora Excursoria, n. 338), Wirtgen (Fl. Rhein. n. 1400 and Fasc. Pl. Crit. 311), and Von Garcke (Fl. N. M. G. 6th edit. 2019). The latter calls it *A. discolor*, Thuill., but it seems probable that Thuillier's plant is not the same. Weihe has also published it (Deutsch. Gram.) under the name of *A. paludosa*, and Reichenbach has figured it in his 'Icones Criticæ,' vol. ii. fig. 280.

In France, Grenier and Godron have united it with *A. discolor* (Fl. de France, vol. iii. p. 508), under the name of *Deschampsia Thuillieri*; Boreau (Fl. du Centre, n. 2663) and Lloyd (Fl. de l'Ouest, p. 519) both describe it under Weihe's name.

It has been gathered also in the south of Scandinavia, but by the northern botanists is regarded as a variety only. Fries (Summa, p. 243) writes respecting it as follows:—"Quamvis hæc charactere foliorum admodum notabili polleat et statione in limo, sæpe ad spicam usque inundata, florendique tempore serotino multis speciebus insignior videatur, tamen in loco natali, sensim magis magisque sicco, formis intermediis in *A. montanam* (i. e. *flexuosa*) ita directe abit ut nullibi transitus magis manifestus." Fries includes it in his 'Herbarium Normale,' part 2. n. 73. Anderson figures it in his 'Gramineæ Scandinaviæ,' plate 12. tab. 143, and expresses entirely the same opinion of its relation to *A. flexuosa.* The accompanying drawing is made from one of Don's specimens.

GOMPHONEMA IN CONJUGATION.

Dr. Henry Carter informs Dr. Gray, that he has for several years, in the beginning of May, found *Gomphonema* in conjugation in a particular spot at Budleigh Salterton, Devon, but that he cannot discover the adventitious sheaths upon the new frustules which are so evident under similar circumstances in *Naviculæ*, etc.

DISCOVERY OF *EUPHORBIA PALUSTRIS* IN SUSSEX.

In a walk with Mr. J. Edwards, of Ditchling, about four years ago, he pointed out to me what I then took to be a form of *E. amygdaloides;* but in looking over my plants this spring, my attention was again attracted to it, and having some doubts of the correctness of my original determination, I showed it to Mr. Baker, who recognized it as being *E. palustris,* which has hitherto only been found in the neighbourhood of Bath. It was found growing with *E. amygdaloides*, in a wood called Blackbrook, in the parish of Westmeston.

W. B. Hemsley.

CORRESPONDENCE.

Arenaria montana, *Linn.*

My friend Mr. E. Penfold, of Worcester College, Oxford, showed me in the early part of last year specimens of *Arenaria montana*, which he found in some abundance among furze on Wimbledon Common, Surrey. He gave me numerous specimens, some of which have been sent to the Thirsk Club.

It was first noticed more than seven years ago by Mr. G. F. Pollock, who remarks, *in litt.*, that it grew then quite as abundantly as now, and was shown by him in a recent state to Dr. Gray at the British Museum, who named it instantly. Mr. Pollock thought that the seed had been wheeled out with garden rubbish. It is perhaps more likely that, like *Claytonia perfoliata*, its seed was brought with grain to the mill on the common. I cannot find any notice of its previous occurrence as an introduced plant. It may be perhaps expected to establish itself, as it occurs in similar situations in Western France, and indeed through the whole of Western Europe.

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Christchurch, Oxford.

NEW PUBLICATIONS.

The Genera of Plants. By Richard Anthony Salisbury, F.R.S., etc. A Fragment, containing part of the *Liriogamæ.* London: 1866. Pp. 143.

Richard Anthony Salisbury was unquestionably one of the most remarkable and distinguished among the botanists of the end of the last century and of the commencement of the present. In the preface to his 'Regni Vegetabilis Systema Naturale,' De Candolle describes him as "ordinum naturalium susceptique nostri fautor *acerrimus.*" He was, in fact, one of the earliest botanists of this country to lay aside the trammels of the artificial system of Linnæus, and to adopt instead the natural method of Jussieu, of whom he became an ardent and devoted follower. The great object of his life was to revise the whole of the Natural Orders of plants, and to publish a 'Genera Plantarum,' founded, as far as possible, on original observations, and adapted to what he considered to be the demands of a more advanced state of the science. He died in 1829, leaving behind him a large amount of material accumulated with a view to this publication, which he bequeathed, together with a considerable part of his property, to the late celebrated

traveller, Dr. Burchell. Dr. Gray, of the British Museum, who had had the advantage, during Salisbury's life, of consulting portions of the intended 'Genera' with a view to the 'Natural Arrangement of British Plants,' and retained a grateful recollection of the kindness thus shown to him in early life, obtained what remained of these materials from the representative of Dr. Burchell, who died in 1863, and has published the present "fragment" as a specimen of what the work would have been if completed in conformity with the intentions of its author.

The fragment here given includes the larger portion of the non-glumaceous Orders of *Monocotyledones*, or, as the author terms them, *Pleurothallæ;* all the non-glumaceous plants being included under the tribual term of *Liriogamæ.* Some of these Orders are not fully worked out, the names of the genera only being given, with observations on their structure and affinities; but in by far the greater number the work is evidently complete. The ordinal and generic characters are given at length, and in Latin, in a mode exactly conformable to that of Jussieu; and at the end of each order the several genera are re-enumerated, with observations in English on their characters, relations, and structural peculiarities, and on the opinions of other botanists in regard to them. It is only to be regretted that in these observations there sometimes mingles a tone of acrimony in reference to some of the author's contemporaries, and in particular to Robert Brown and Sir James E. Smith, which is occasionally extended to Ker and Herbert, and even to Adanson and Linnæus. This, however, is characteristic of the man, of whom De Candolle says, in his Autobiography, "C'était un homme d'esprit vif et d'une pétulance extraordinaire," and whom he elsewhere, as we have seen, characterizes as "acerrimus."

Like most of those who have worked largely on garden plants, and especially on Orders of which the far greater number of species are in cultivation, Salisbury's tendency was to minute subdivision both of orders and genera. In his hands nearly all the larger genera, such as *Amaryllis*, *Narcissus*, and *Allium*, become orders, each subdivided into numerous genera. This practice he defends, under the Order *Narcisseæ*, by the following arguments:—

"Many botanists of the present day may be of opinion that these plants do not constitute a legitimate Order, and whether mine or theirs be hereafter fol-

lowed is of little importance, provided each species is placed where its most striking similitudes demand. I shall probably be still more reproached for dividing them into genera, though these are often so obvious and decided that our vulgar clowns have given names to them; nor will a Daffodil, Hoop Petticoat, Jonquil, or Primrose Peerless, ever be confounded by those genuine followers of nature. Therefore, after quoting an adage, which is particularly applicable to this case, '*male agitur cum Domino quem villicus docet*,' I have only to say, that if every class, order, genus, and species could be distinguished by characters of equal value, this very uniformity, however suited to such as are doomed to plod over the dull formal track of Linné, could not fail to disgust every one who has rambled through the cheerful winding path of A. L. de Jussieu. In fact, the Creator, among those of his works which we are permitted partly to know, has combined the living herbs into groups, as varied in shades of affinity as the tints of their flowers; and a truly philosophical student, after attempting, peradventure not entirely without success, to measure some of their intervals, finds a commodious resting-place in any of them, when fatigued with the multiplicity of the lovely objects before him."

And again, under *Strumareæ*:—

"They have been referred to one genus by Jacquin, from whom I merely differ in calling all such combinations as this an Order; and any one or more species among them, unlike the rest in certain material points, a genus. The number of vegetables at present discovered, to say nothing of those undiscovered, comes much nearer to Commerson's calculation of all which are in existence on the earth than to Linné's, affording in itself a powerful argument, if there were no other, for the multiplication of genera; and the labours of several eminent botanists in this branch of the science are rapidly proving that, if every species admitted into a genus corresponded more strictly with the type in its organs of reproduction, ten times as many as are now established, would make botany ten times more easy to learn, and ten times more delightful when learnt. None of these penultimate groups can rest on a solid foundation till all the species in them have been carefully compared, the differences of which often run gradually into one another, or can only be detected in the living state. Hence Solander, who preferred dried specimens that he might not use characters liable to disappear in an herbarium, fell into the error of describing *Agapanthus* with a regular corolla; nor has *Strumaria* any immediate affinity to *Leucoium*, as he supposed. Dryander, on the contrary, never trusted to a dried plant if he could see it living; and Jacquin has most happily expressed my ideas of what is necessary to a generic assemblage in the following lines, partly Ovid's,

"'Par cunctis facies, qualem decet esse sororum
Et diversa tamen eadem est gratia formæ
Ut mox agnoscas, quâ sint de stirpe creatæ.'"

Of course there is much in the present publication, coming as it does nearly forty years after its date, that has already found its way into

botanical science; and those who might be disposed to adopt the author's views in reference to the multiplication of genera, would find many of his divisions established under other names; but there is one genus with which, as far as we are aware, no one has yet meddled with a view to its generic subdivision, and which we may therefore take as an example of the extent to which the author has carried his principle. This is the genus *Allium*, constituting in the present work the Order *Cepææ*. In Don's Monograph, which has been closely followed by Kunth, this genus is arranged under eleven divisions, to seven of which names are given, but apparently not meant even as subgeneric. In the work before us, *Allium* is divided into no fewer than eighteen genera, as follows:—

HEXONYCHIA=*Allium stellatum.*
CALLIPRENE=*A. cernuum.*
RAPHIONE=*A. pallens,* etc.
XYLORHIZA=*A. senescens,* etc.
BERENICE=*A. Victorialis.*
ALLIUM=*A. nutans.*
PORRUM=*A. Ampeloprasum,* etc.
CEPA=*A. Cepa.*
PHYLLODOLON=*A. fistulosum.*
CAMARILLA=*A. obliquum.*
SCHŒNISSA=*A. Schœnoprasum.*
BUTOMISSA=*A. Tataricum.*
HYLOGETON=*A. ursinum.*
MOLYZA=*A. Moly.*
CANIDIA=*A. magicum.*
IULUS=*A. subhirsutum.*
SATURNIA=*A. Chamæmoly.*
BRISEIS=*A. triquetrum.*

On these divisions the author makes the following observations:—

"The fœtid smell which these vegetables so generally exhale has been since the time of Linné, I may say, the only character of *Allium*; every one which had it, however discordant either in its organs of vegetation or reproduction, being joined together by him, in his rage for abolishing the genera of Tournefort; till at last, to make Governor Tulbagh some amends for not adopting that genus which Heister had called by his name, he selected two plants of the preceding Order to perpetuate it. The smell of *Cepææ* is indeed frequently so intolerable, that after dissecting about half the species in our collections, I

abandoned the rest. Those now described, however, seem to me types of legitimate genera, differing often materially, not only in leaves and flowers, but in their fruits and seeds, which latter Haller and Linné neglected to examine; and to join them all in one genus solely for their peculiar juice would be as absurd as to join all *Ricineæ*, *Diosmeæ*, *Amyrideæ*, *Asclepiadeæ*, *Myrteæ*, or *Laureæ*."

However little botanists at the present day may be disposed to concur in such extreme subdivision, or in the arguments by which it is supported, there is no doubt that much may be gained from the observations of so accurate and careful an investigator; and it is well to have such a specimen to refer to of the mode in which he proposed to carry out his principles. Dr. Gray deserves well of science for having furnished us with it, and for having left it exactly in the form in which it came into his hands, without any attempt at adaptation, and without reference to publications which have appeared subsequent to its preparation by its author for the press.

INTERNATIONAL BOTANICAL CONGRESS.

The Meetings of the Congress were held in the South Kensington Museum, the first, on May 23rd, in the Raphael Cartoon Gallery, and the second, on May 24th, in the Sheepshanks Gallery. A very large meeting, including almost all the British and foreign botanists and horticulturists present in London, assembled to hear the President's address. Among the foreign botanists were Lecoq (Clermont-Ferrand), Weddell (Poitiers), Kickx (Ghent), Morren (Liége), Van Heurck (Antwerp), Caspary (Königsberg), Reichenbach (Hamburg), Karl Koch (Berlin), Schultz-Bipontinus (Diedesheim), Wendland (Hanover), Meissner (Basle), and Triana (New Granada); and of British botanists, Bennett (British Museum), Berkeley (London), Daubeny (Oxford), Miers (London), Moore (Dublin), Gray (British Museum), Bentley (London), Masters (London), Dickson (Edinburgh), Howard (London), Wight (London), Ward (London), etc. etc.

The business had been arranged by the Congress Committee, and everything was admirably carried out under the direction of Dr. Masters, Secretary to the Congress.

The following works were laid on the table:—

A Manuscript Clavis to the 'Hortus Malabaricus.' By Dr. Hasskarll.

Several Papers by Professor Gasparini.

'On the Species of Cotton.' With Illustrations. By Professor Parlatore.

Water-colour Drawings, with Analyses of the Flowers. By M. J. Platzmann, of Leipsic.

Water-colour Drawings of British Plants. By Mr. W. G. Smith, of London.

Before proceeding to the business of the meeting, the President made a preliminary statement in English, first as a mark of respect to England, and next in explanation of his views for the conduct of present and future meetings of this kind. We have to choose, he said, between two alternatives, either that every member should speak in his own language or in that of the country where the Congress meets. This last method would destroy that equality between members which is desirable in every public assembly. Not a few would be reduced to silence, or at least prevented from taking part in the discussion, and several distinguished men might on this account avoid international congresses. The other plan, of letting one speak in his own language, appears to me to be much more convenient. For these reasons, I shall address you in French, and in doing so I establish in fact the right of every Englishman to speak in English at Paris or Berlin, at Florence or Vienna, under similar circumstances.

Professor De Candolle then read his inaugural address in French, of which the following is a literal translation :—

In order to derive the full advantage from a meeting of so many lovers of science, horticulturists and botanists, brought together from all parts of Europe, it is necessary that the common object for which they have met should be perfectly understood.

It devolves on me, who am called upon to preside (an honour of which I feel myself unworthy), to point out the bond which unites us, and of which perhaps you have, at present, but a vague and, so to speak, an intuitive perception.

In my opinion, we are not here merely as amateurs to satisfy our curiosity. The proof of which is, we are here assembled to listen to discussions, instead of wandering about the fairy-like garden of the Exhibition. Evidently we seek something more than a mere show, and that something is, in my opinion, instruction. It is not sufficient

for horticulturists merely to see—they must also study and reflect; neither is it sufficient for botanists to observe details minutely—they must also see the plants on a large scale and in grouped masses. The connection of practice with theory, and of art with science, is acknowledged to be indispensable; and in accordance with this prevalent opinion we here affirm, by our presence in this room, the necessary union of botany and horticulture. The aim of my brief observations will be to call to mind how they aid each other, and to show how much more they might do so. If I am not mistaken, it will follow from facts to which I shall allude, that our united efforts, scientific or practical, modest though they appear, contribute to increase the well-being of man, in all conditions and in all countries.

1. *The Advantages of Horticulture to Botany.*

Let us first mention the services that horticulture renders, or may render, to botany. Without being myself a horticulturist, I affirm or recognise them willingly, the advancement of science rendering it necessary to have recourse to all its collateral branches.

We no longer live in those times of illusion, when botanists merely occupied themselves with European plants, or with a few from the East, and, from a spirit of caution rather than from ignorance, pictured to themselves all distant countries as possessing much the same general vegetation, with a few uncommon or exceptional species. A century of discovery has made known the extreme variety of the Floras, the restricted limits of many species, and the complicated entanglement of their geographical distribution. To see all the different forms of vegetation of the world, one would realize in a degree the history of the Wandering Jew; besides, with this constant travelling, where would be the opportunities for that reflection or study which create true science?

The traveller is too much exhausted in warm countries, too distracted in those temperate regions favourable to active life, and his faculties are too much benumbed in the colder regions, to enable him to devote himself to minute researches with the lens or the microscope, or even to sketch or properly describe that which he has gathered. He sees, in passing, a crowd of things, but he can scarcely ever stop to enter into details, especially of those that come in rapid succession. Rarely can he see the fruit and flower of a species at the same time,

and it is quite impossible for him to study their complete development during the whole year. The notes taken by the most intelligent naturalist are so affected by these fatal circumstances, that it is seldom they add anything to that which a dried specimen can teach the sedentary botanist.

It is horticulture, then, which brings before us a multitude of exotic plants in a condition best adapted for study. Thanks to the variety of species it accumulates and successfully cultivates, the botanist can investigate the most difficult questions, and pursue his researches in families whose genera are not indigenous in Europe. In the herbarium more minute observations can be made than is generally supposed; nevertheless, for certain researches, it is absolutely necessary to have the living plant, particularly for those relating to relative disposition, the origin and development of the several organs, as well as for studying the curious phenomena of fertilization, the movements and direction of the stem, leaves, and parts of the flowers. Horticulture has done much to advance the progress of physiological botany, but it still has much to do. The most remarkable experiments of physiologists—viz. those of Hales, Duhamel, Knight—have been made in gardens. Also the long series of experiments of the younger Gærtner, and, more recently, of M. Naudin, on hybridization, which relate to the cardinal subject of the species. As much may be said of the numerous trials which are made, in horticultural establishments, to obtain new races or varieties. These have a great scientific importance, and it is undoubtedly the horticulturists who are the teachers of botanists on these subjects.

It appears to me, however, gardens can be made still more useful in carrying out physiological researches. For instance, there is much yet to be learnt on the mode of action of heat, light, and electricity upon vegetation. I pointed out many of these deficiencies in 1855, in my 'Géographie Botanique Raisonnée.'* Ten years later, Mr. Julius Sachs, in his recently-published and valuable work on physiological botany,† remarks much the same deficiencies, notwithstanding that some progress has been made in these matters. The evil consists in this, that when it is desired to observe the action of temperature, either

* Pages 46, 49, 57, and 1346.

† 'Handbuch der Experimental-Physiologie der Pflanzen,' 1 vol. 8vo. Leipzig, 1865.

fixed or varied, mean or extreme, or the effect of light, it is exceedingly difficult, and sometimes impossible, when observations are made in the usual manner, to eliminate the effects of the constant variations of heat and light. In the laboratory it is possible to operate under more exactly defined conditions, but they are rarely sufficiently persistent; and the observer is led into error by growing plants in too contracted a space, either in tubes or bell-glasses. This last objection is apparent when it is wished to ascertain the influence of the gases diffused in the atmosphere around plants, or that of the plants themselves upon the atmosphere.

Place plants under a receiver, they are no longer in a natural condition; leave them in the open air, and the winds and currents, produced at each moment of the day by the temperature, disperse the gaseous bodies in the atmosphere. Every one is aware of the numerous discussions concerning the more or less pernicious influence of the gases given off from certain manufactories. The ruin now of a manufacturer, now of a horticulturist, may result from the declaration of an expert; hence, it is incumbent on scientific men not to pronounce on these delicate questions without substantial proof.

With a view to these researches, of which I merely point out the general nature, but which are immensely varied in details, I lately put this question:*—"Could not experimental greenhouses be built, in which the temperature might be regulated for a prolonged time, and be either fixed, constant, or variable, according to the wish of the observer?" My question passed unnoticed in a voluminous work, where, in truth, it was but an accessory. I renew it now in the presence of an assembly admirably qualified to solve it. I should like, were it possible, to have a greenhouse placed in some large horticultural establishment or botanic garden, under the direction of some ingenious and accurate physiologist, and adapted to experiments on vegetable physiology; and this is, within a little, my idea of such a construction:—

The building should be sheltered from all external variations of temperature; to effect which, I imagine it should be in a great measure below the level of the ground. I would have it built of thick brickwork in the form of a vault. The upper convexity, which would rise above the ground, should have two openings—one exposed to the

* 'Géographie Botanique,' 1855, pp. 49, 1346.

south, the other to north—in order to receive the direct rays of the sun or diffused light. These apertures should each be closed by two very transparent glass windows, hermetically fixed. Besides which, there should be, on the outside, means of excluding the light, in order to obtain complete darkness, and to diminish the influence of the variations of temperature when light was not required. By sinking it in the ground, by the thickness of its walls, and by the covering of its exterior surfaces with straw, mats, etc., the same fixed degree of temperature could be obtained as in a cellar. The vaulted building should have an underground communication with a chamber containing the heating and the electrical apparatus. The entrance into the experimental hothouse should be through a passage closed by a series of successive doors. The temperature should be regulated by metallic conductors, heated or cooled at a distance. Engineers have already devised means by which the temperature of a room, acting on a valve, regulates the entry or exit of a certain amount of air, so that the heat regulates itself.* Use could be made of such an apparatus when necessary.

Obviously, with a hothouse thus constructed, the growth of plants could be followed from their germination to the ripening of their seeds, under the influence of a temperature and an amount of light perfectly definite in intensity. It could then be ascertained how heat acts during the successive phases from sowing to germination, from germination to flowering, and from this on to the ripening of the seed. For different species various curves could be constructed to express the action of heat on each function, and of which there are already some in illustration of the most simple phenomena, such as germination,† the growth of stems, and the course of the sap in the interior of certain cells.‡ We should be able to fix a great number of those minima and maxima of temperature which limit physiological phenomena. In-

* See the electric apparatus of M. Carbonnier, exhibited at Chiswick in 1857, figured in the 'Flore des Serres et Jardins,' vol. xii. Miscell. p. 184.

† Germination under different degrees of constant heat, by Alph. de Candolle, in the 'Bibliothèque Universelle de Genève' (Archives des Sciences), November, 1865.

‡ If the curves have not been constructed, the data for their construction are, at least, dispersed throughout our books. I will cite, for instance, the growth of a scape of *Dasylirion*, as observed by M. Ed. Morren (Belgique Hortic. 1865, p. 322). The figures there given are not favourable to the accepted notion, that the growth of tissues is more active by night than by day.

deed, a question more complicated might be investigated, towards the solution of which science has already made some advances, namely, that of the action of variable temperatures; and it might be seen, if, as appears to be the case, these temperatures are sometimes beneficial, at other times injurious, according to the species, the function investigated, and the range of temperature. The action of light on vegetation has given rise to the most ingenious experiments. Unfortunately, these experiments have sometimes ended in contradictory and uncertain results. The best ascertained facts are, the importance of sunlight for green colouring, the decomposition of carbonic acid gas by the foliage, and certain phenomena relating to the direction or position of stems and leaves. There remains much yet to learn upon the effect of diffused light, the combination of time and light, and the relative importance of light and heat. Does a prolonged light of several days or weeks, such as occurs in the Polar regions, produce in exhalation of oxygen, and in the fixing of green matter, as much effect as the light distributed during daily interrupted periods of twelve hours, as at the Equator? No one knows. In this case, as for temperature, curves should be constructed, showing the increasing or diminishing action of light on the performance of each function; and as the electric light resembles that of the sun, we could in our experimental hothouse submit vegetation to a continued light.*

A building such as I propose would allow of light being passed through coloured glasses or coloured solutions, and so prove the effect of the different visible or invisible rays which enter into the composition of sunlight. For the sake of exactness nothing is superior to the decomposition of the luminous rays by a prism, and the fixing the rays by means of a heliostat. Nevertheless, a judicious selection of colouring matters, and a logical method of performing our experiments, will lead to good results. I will give as proof, that the recent most careful experiments concerning the action of various rays upon the production

* The apparatus which produces the most persistent and vivid light is the magneto-electric machine, based on the development of induction by magnetism, as discovered by the illustrious Faraday. The galvanic pile is replaced by a steam-engine of low power, which sets in motion a wheel furnished with magnets (Bibl. Univ. de Genève, Archives Scientif. 1861, vol. x. p. 160). The working of this machine is inexpensive, but, unfortunately, the magnets are very costly. This system has already been applied to two lighthouses—that at the South Foreland, and to that of the "Société l'Alliance," at Havre—in consequence of the experiments of MM. E. Becquerel and Tresca.

of oxygen by leaves, and upon the production of the green colouring-matter, have only confirmed the discoveries made in 1836, without either prism or heliostat, by Professor Daubeny,* from which it appears the most luminous rays have the most power, next to them the hottest rays, and lastly those called chemical.

Dr. Gardner, in 1843, Mr. Draper immediately after, and Dr. C. M. Guillemin in 1857,† corroborated by means of the prism and the heliostat the discovery of Dr. Daubeny, which negatived the opinions prevalent since the time of Senebier and Tessier, and which were the result of erroneous ‡ experiments. It was difficult to believe that the most refrangible rays,—violet for instance, which acts the most on metallic bodies,—as in photometrical operations, should be precisely those which have least effect in decomposing the carbonic acid gas in plants, and have the least effect over the green matter in leaves. Notwithstanding the confirmation of all the experiments made by Dr. Daubeny, when repeated by numerous physicists and by more accurate methods, the old opinions, appearing more probable, still influenced many minds,§ till Mr. Julius Sachs, in a series of very important experiments again affirmed the truth.‖ It is really the yellow and orange rays that have the most power, and the blue and violet rays the least, in the phenomena of vegetable chemistry; contrary to that which occurs in mineral chemistry, at least in the case of chloride of silver. The least refrangible rays, such as orange and yellow, have also the

* Daubeny, Phil. Trans., 1836, part 1.

† Dr. Gardner, Edinb. Phil. Mag. 1844, extract in French in La Biblioth. Univ. de Genève, February, 1844; Draper, Edinb. Phil. Mag., September, 1844, extract *ib.* 1844, vol. liv.; Guillemin (C. M.), Ann. Sc. Nat. 1857, ser. 4, vol. vii. p. 154.

‡ Senebier, Mém. Phys. et Chim., ii. p. 69; Tessier, Mém. Acad. Sc. 1783; Gilby, Ann. de Chimie, 1821, vol. xvii.; Succow, 'Commentatio de Lucis Effectibus Chemicis,' 4to, Jena, 1828, p. 61; Zantedeschi, cited by Dutrochet, Compt. Rend. Acad. Sc. 1844, sem. 1, p. 853.

§ As a proof of the persistence of the old opinion, I will quote a phrase of Professor Tyndall's, in his most clear and interesting treatise 'On Radiation' (London, 1865), p. 6:—"In consequence of their chemical energy, these ultra-violet rays are of the utmost importance to the organic world." I do not know whether the author had in view an influence of the chemical rays over the animal kingdom; but, according to certain passages of Mr. Sachs, I doubt if they have more power over animals than they have over plants; besides, Professor Tyndall did not concern himself with these questions, he was content to explain admirably the physical nature of the various rays.

‖ The researches of Mr. Sachs first appeared in the 'Botanische Zeitung;' they are collected and condensed in the remarkable volume called 'Handbuch der Physiologischen Botanik,' vol. iv., Leipzig, 1865, pp. 1–46.

twofold and contrary property, such as pertains also to white light, and which produces the green colouring-matter of leaves or bleaches them, according to its intensity. It is these, also, which change the colouring matter of flowers when it has been dissolved in water or alcohol.* Those rays called chemical, such as violet, and the invisible rays beyond violet, according to recent experiments, confirmatory of those of ancient authors—those of Sebastian Poggioli, in 1817,† and of C. M. Guillemin—have but one single well-ascertained effect, that of favouring the bending of the stem towards the quarter from which they come more decidedly than do other rays; yet that is an effect perhaps more negative than positive, if the flexure proceeds, as many still believe, from what is going on on the side least exposed to the light.‡

The effect upon vegetation of the non-visible calorific rays at the other extremity of the spectrum have been but little studied. According to the experiments we have on this subject, they would appear to have but little power over any of the functions; but it would be worth while to investigate further the calorific regions of the spectrum by employing Dr. Tyndall's process, that is, by means of iodine dissolved in bisulphide of carbon, which permits no trace of visible light to pass.

How interesting it would be to make all these laboratory experiments on a large scale! Instead of looking into small cases, or into a small apparatus held in the hand, and in which the plants cannot be well seen, the observer would himself be inside the apparatus, and could arrange the plants as desired. He might observe several species at the same time, plants of all habits, climbing plants, sensitive plants, those with coloured foliage, as well as ordinary plants. The experiment might be prolonged as long as desirable, and, probably, unlooked-for results would occur as to the form, or colour of the organs, particularly of the leaves.

Permit me to recall on this subject an experiment made in 1853 by Professor Von Martius.§ It will interest horticulturists now that plants with coloured foliage become more and more fashionable. M.

* Sir John Herschel, Edinb. Philos. Journ., January, 1843.

† S. Poggioli, 'Opuscoli Scientifici,' quoted by Dutrochet, Compt. Rend. Acad. Sc., 1844, sem. 1, p. 850.

‡ The rather confused and questionable explanations, founded on the notions of Dutrochet, of the existence of a deoxidizing power on the brightest side, clash against the fact that the blue, indigo, and violet rays, the least powerful for deoxidizing tissues, are the most powerful in causing them to bend.

§ 'Gelehrte Anzeige,' München, 2nd Dec. 1853.

Von Martius placed some plants of *Amaranthus tricolor* for two months under glasses of various colours. Under the yellow glass, the varied tints of the leaves were all preserved. The red glass rather impeded the development of the leaves, and produced, at the base of the limb, yellow instead of green; in the middle of the upper surface, yellow instead of reddish-brown, and below, a red spot instead of purplish-red. With the blue glasses, which allowed some green and yellow to pass, that which was red or yellow in the leaf had spread, so that there only remained a green border or edge. Under the nearly pure violet glasses, the foliage became almost uniformly green. Thus, by means of coloured glasses, provided they are not yellow, horticulturists may hope to obtain at least temporary effects, as to the colouring of variegated foliage.

The action of electricity on vegetation is so doubtful, so difficult to experiment upon, that I dare hardly mention it; but it can easily be understood how a building constructed as proposed might facilitate experiments on this subject. Respecting the action of plants on the surrounding air, and the influence of a certain composition of the atmosphere upon vegetation, there would be by these means a large field open for experiments. Nothing would be easier than to create in the experimental hothouse an atmosphere charged with noxious gas, and to ascertain the exact degree of its action by day and by night. An atmosphere of carbonic acid gas might also be created, such as is supposed to have existed in the coal period. Then it might be seen to what extent our present vegetation would take an excess of carbon from the air, and if its general existence were inconvenienced by it. Then it might be ascertained what tribes of plants could bear this condition, and other families could not have existed, supposing the air had formerly had a very strong proportion of carbonic acid gas.

Until horticulture can supply physiology with such convenient means of experiment, it, in the meantime, advances descriptive botany by the valuable publications it issues. The greater part of the old works with plates, such as 'Hortus Eystettensis,' 'Hortus Elthamensis,' etc.; also those of Ventenat, Cels, Redouté, etc.; the 'Salictum' and 'Pinetum' of the Duke of Bedford; and more recently the 'Rhododendrons of the Himalaya,' by Dr. Hooker; the works of Bateman, Pescatore, Reichenbach fil., on Orchids; and many others I could name, would never have existed, had there not been rich amateurs either to edit or buy them.

It is horticulture that has given us the longest series of illustrated journals that have ever been published: and here I must do justice especially to the English horticulturists. No doubt the science of our time requires a larger amount of analytical details than is contained in the plates of the 'Botanical Magazine,' 'Botanical Register,' 'Andrews's Repository,' 'Loddiges' Botanical Cabinet,' 'Sweet's British Flower-garden,' 'Paxton's Magazine and Flower-garden,' and other English journals; but what a number of forms are thus fixed by the engravings in these books, and what a fund of valuable documents for consultation they afford! One must admire the 'Botanical Magazine,' commenced in 1793, continued from month to month with an exemplary regularity, and which is now at its 5580th plate. Not only has it always represented rare and new species, but it has ever been conducted on a simple and uniform plan, which renders it convenient to consult.

The series of plates is unique from the very beginning. Each plate has its number, and each article of letterpress refers only to one plate, by which means the quotations from the work are rendered brief and clear. Many editors have not understood the advantage of this simple arrangement. They have varied their titles, their series, their pagings; they have affixed to their plates numbers, then letters, then nothing at all; the end of which is (and this ought to serve as a warning for the future) that the more they have altered and complicated the form of their journals, the shorter time have they lasted.

How is it that these purely bibliographical details cause in us such sad recollections? Of the men just mentioned, who have rendered such eminent service to botany and horticulture, England has lost three during the year 1865—Sir Joseph Paxton, Dr. Lindley, and Sir William Jackson Hooker.* I should certainly fail in what is expected of me if I did not express, in the name of the foreigners attending this meeting, our deep regret at such serious losses. We know them all by their writings, and many amongst us have known personally the distinguished men I have mentioned. Their names follow us at each step in this the scene of their labours. If we admire the boldness of construction of the iron domes that characterize modern buildings, we

* Since these lines were in the printer's hands, British science has sustained a severe loss in the death of the truly amiable and learned Professor W. H. Harvey, of Dublin.

think of the Crystal Palace, of Chatsworth, and of the humble gardener who became a great architect. If we visit the beautiful establishment at Kew, we see everywhere around us proofs of the indefatigable activity of Sir William Hooker. Lastly, if we ask the origin of the garden of the Royal Horticultural Society at Kensington, we are told it is only a development of that at Chiswick, where Lindley stood pre-eminent by his knowledge and his energy; and of that society where botanists of my age found in their youth such valuable encouragement in their studies.

The names of Sir William Hooker and of Dr. Lindley, thanks to their special works, will ever remain distinguished in science. These two botanists have, moreover, been directors of horticultural journals, and of great horticultural establishments, and since their influence has been so fully acknowledged by practical men, I shall have little trouble in showing that science is as useful to horticulturists as horticulture is to botanists,—and this will form the second part of my discourse.

2. *The Advantage of Botany to Horticulture.*

The principles of vegetable physiology are what horticulturists and agriculturists usually study in books on botany. They do not always find direct answers to their questions; but they can draw from them certain rules, certain ways of experimentalizing and reasoning, which save them from falling into many errors. Should some ridiculous idea be promulgated by some ignoramus or charlatan, it is by an appeal to the general rules of physiology that a practical man may at once reject them, or, at least, hold them in distrust. On the contrary, innovations, if in harmony with the principles, may be, and I will even say, ought to be readily accepted.

Do not let us put too much faith in the lucky results of experiments made absolutely by chance. It is with some of these experiments as with dreams and presentiments,—if they come true once in a thousand times they are talked about, otherwise they are passed over and forgotten. Besides, it must be said, men nearly always are guided by theories; but the theories of the ignorant are often absurd and without foundation, whilst those of educated men are based on probabilities, or on an accumulation of facts.

Conjointly with physiology, botanical geography shows the distribution of plants all over the globe, their struggle with the elements, their

migrations, and already raises a portion of the veil which covers the obscurity of their origin. All this ought to offer a real interest to horticulturists. We are beginning to have the power of stating in figures the effect of each climate upon vegetation; consequently, the possibility of a given species enduring the mean or extreme climatal conditions of that country to which it is desired to introduce it. Already we can show, in the clearest manner, the analogy between the vegetation and climate of certain regions widely separated the one from the other, and point out in which cases new attempts at cultivation should be tried or where they should be discouraged. A celebrated geologist was able to say, beforehand, there is gold in such a part of New Holland; and gold was found there. We can also say the Olive-tree and the Cork Oak will succeed in Australia; the eastern and temperate region of the United States is favourable to the growth of Chinese plants, more particularly to that of tea; and we can assert that that part of America included between San Francisco and the Oregon territory will one day supply wines as varied and as excellent as those European ones produced between Portugal and the Rhine. It is a singular fact that the two principal beverages of the civilized world, wine and tea, which produce similar stimulating effects, but which to a certain extent are the substitutes one for the other in different countries, present also in the mode of cultivating them the most marked resemblances and differences. The Vine and the Tea-plant succeed best on stony, barren hillsides, of which they sometimes increase the value a hundredfold.

According to the exposure, the soil, the cultivation and manner of preparing the produce, wine and tea are obtained of unquestionable excellence; whilst the neighbouring crops, but a short distance off, may be more or less ordinary in quality. The two shrubs require a temperate climate, but the Vine needs heat and no rain during summer, whilst the Tea-plant requires rain and but little summer-heat; the result of which is that these two species are almost geographically incompatible. Vine-growing countries will never produce tea, and *vice versâ*.

But you will say these examples belong rather to agriculture, and concern neither botany nor gardens. I maintain the contrary. It is science, in the present day, which points out what plants to cultivate, and into what countries to introduce them. Horticulture makes the

trial with infinite pains. If successful, the young plants are submitted to the less careful treatment of agriculture. Before the happy introduction of Cinchonas into British and Dutch India could be effected, botanists were required to collect, distinguish, and carefully describe the various species of American Cinchonas; horticulturists were then called on to make cuttings, gather the seeds, raise the young plants, transport and establish them in another part of the world; and so at last they were passed over to the care of the agriculturists. The Coffee-plant did not spread gradually from Arabia to India, from India to Java; nor was it the American colonists who brought it from its original country to their *fazendas* or *haciendas*. The shrub was first described by botanists, and was afterwards introduced by the Dutch into a garden at Batavia; from thence it was taken to the Botanical Garden at Amsterdam, from whence a specimen was sent to the King of France in 1714. De Clieu, a naval officer, transplanted it from the garden at Paris to the French colonies in America. A multitude of such instances might be named. In the present day science has progressed, practical men avail themselves of it, governments and nations have abandoned those mistaken ideas in accordance with which it was supposed that a cultivation advantageous to one country was injurious to others. Hence we may hope to see, before long, useful species planted in all regions where they can thrive, to the great advantage of mankind in general.

One of the most evident effects of science has been to create in the horticultural public a taste for varied and rare forms. Formerly in gardens there were only to be found certain kinds of plants which dated back to the time of the Crusades, or even of the Romans. The discovery of the New World did not produce a change in proportion to its importance; perhaps because horticulturists did not travel enough, or acquaint themselves with those countries whose species were most suitable for cultivation in Europe. Botanists, fortunately, were more ambitious. Their collectors were numerous and daring. They enriched their herbaria with an infinitude of new forms, and published works upon exotic plants, such as those of Hernandez, Rumphius, Sloane, etc. The immense variety in the forms of plants was thenceforth recognised, and in point of taste the elegant simplicity of the primitive flowers was able to vie with the gaudiness of the double ones. Then ceased the reign of Tulips and Pæonies in flower-gardens.

Curiosity, that great incentive to all science, having penetrated horticulture, the change in gardens became rapid. Instead of a few hundred species such as were cultivated at the commencement of the last century, there are now 20,000 or 30,000 to be found in most of the present catalogues. The single family of Orchids has probably more different representatives in our hothouses than was the case with all the families of plants put together a hundred years ago. Fashion, united to the present curiosity of amateurs, causes from time to time old plants to be abandoned for new ones; and thus the entire vegetable kingdom will ultimately pass under the observation of civilized men.

What would horticulturists do, amidst this invasion of thousands of species, had not botanists devised convenient plans of classification and nomenclature? The families, genera, and species have all been arranged in books, just as the districts, streets, and numbers of the houses are in our great capitals—with this superiority of method, that the form of the objects indicates their place,—as if, in looking at a house in town, one might discover at a glance to what street and what quarter it belonged. The plan of giving a single name to each species, besides its generic name, together with the prohibition of changing names without due reason, of giving the same appellation to two different species or two genera, far excels our plan of distinguishing individuals. How much it would simplify our intercourse with men, and facilitate our inquiries, if, in the whole world, the members of one family only bore the same name, and if each individual had but one christian name, differing from those of the other members of his family. Such is, nevertheless, the admirable plan of nomenclature that science has provided for horticulturists, and which they cannot too much appreciate and respect.*

* Two years ago I made a request to the "Fédération des Sociétés d'Horticulture Belges," which appears to have been favourably received, and it may not be useless to repeat it here. It consisted in begging the horticulturists who obtain new varieties not to give them botanical names, with a Latin designation, but merely arbitrary names of quite a different nature, in order to avoid confusion and useless researches in books. For example, if they called a Calceolaria *Sebastopol*, or *Triomphe de Gand*, every one would understand it meant a garden variety; but if they named it *Lindleyi*, or *mirabilis*, one would think that it was a botanical species, and would search for it in scientific works, or in the Floras of Chili; and botanists, happening perhaps to mistake it, add it to the end of the genus in their books as a species imperfectly known. The more horticultural names differ from Latin ones the better it is, unless

3. *The Beneficial Effects of the Association of Botany with Horticulture.*

The pursuit of horticulture demands books and herbaria, as that of scientific botany requires cultivated, living plants. Thence the necessity, which is more and more recognized, of bringing together the materials for comparison in the same town, the same establishment, and even under the same administration, organized so as to facilitate the use of them. How many institutions in Europe, either private or public, would be benefited by this arrangement! How many towns and countries are now deficient—some in libraries, some in herbaria, some in respect to horticulture! Professional men proffer their complaint; let us hope that public opinion may end by listening to them.*

The bringing together the means of study, I have said, is desirable. Not less so is the interchange of ideas and impressions both of botanists and horticulturists. Each of these classes must clearly have distinct characteristics; but the one should be influenced by the other. By these means some too retiring dispositions may be brought out, and certain dormant powers developed. Horticulture, for instance, has a commercial tendency which may be carried too far. Charlatanism may slide in amongst flowers. Botany, on the contrary, is a science, and consequently rests on the investigation of pure and simple truth. A horticulturist who allows himself to be influenced by a scientific spirit, necessarily frees himself from over-selfish tendencies. Natural history, on its side, by reason of the perfection of its method, its nomenclature and its minute observations, has something technical and dry about it, which contrasts with the grandeur of nature and with the sentiment of art. It is for horticulture, combining as it does the planning and the decorations of gardens, to develop the æsthetic faculties of the *savant*, as of the world in general. A lovely flower, beautiful trees, a splendid floral exhibition, excite a sort of admiration, and even enthusiasm, similar to the effects produced by music or painting.

The powers of the German composers of modern days, and those of the Italian painters of the sixteenth century, are justly extolled; but may it not also be said, that in point of art they are equalled in their

they can be appended to the scientific nomenclature: as when we say *Brassica campestris oleifera*, instead of, shortly, Colza.

* The Botanical Gardens at Kew are a fine example of what should be done, either on a large or a more modest scale, in many towns where the means of study are yet inconvenient or incomplete.

way by the beautiful parks of old England? The feeling of harmony in form and colour, is it not also studied in them? The effect of contrast, is it not skilfully managed? The gradual transition from architectural to natural beauties, is it not treated in an admirable manner? Yes; decidedly the English landscape-gardeners are poets; they have drawn from the same sources of inspiration as the most national writers of their country, and that source is the appreciation, so universal in England, of the beautiful, in an aspect of nature which is elegant and attractive, though somewhat severe.

Thus, gentlemen, for the development of our talents, as well as for our actual benefit, art and science keep pace together. Let us rejoice over their union, rendered conspicuous to-day by this congress of botanists, held in connection with a great floral exhibition; and after these general observations—perhaps rather too protracted—let us enter upon the consideration of those more truly scientific subjects, in which many among you are no doubt disposed to take part.

On the conclusion of M. De Candolle's address, a vote of thanks was warmly tendered to him, on the motion of Sir C. Wentworth Dilke. Sir Roderick I. Murchison, in seconding the motion, alluded to the philosophic views of the President, and the masterly way in which he had handled his subject. Mr. Bennett (of the British Museum), on the part of the botanists of Britain, tendered his thanks to the eminent Chairman for the honour he had conferred on them by presiding, and specially for the preparation of so admirable an address, to which M. De Candolle briefly replied.

Dr. Schulz-Bipontinus, Diedesheim, a Vice-President of the Imperial Leopoldine Academy, offered the congratulations of that learned and ancient body to the President and members of the Congress.

The Congress then proceeded to hear the papers, abstracts of which had been placed in the hands of the audience.

Dr. Moore, Dublin, exhibited and described specimens of *Megacarpæa polyandra*, a Cruciferous plant with fifteen stamens.

Mr. Rivers, Sawbridgeworth, made some remarks on Seedling Peaches and Nectarines.

Professor CASPARY, Königsberg.—"On the Change in the Direc-

tion of the Branches of Woody Plants caused by Low Degrees of Temperature."

The author, in this paper, gave with much elaboration the result of his observations on the motion observed in the branches of trees in frosty weather. He showed that there is in winter a movement of the branches to the left-hand side, the amount of which is in direct proportion to the intensity of the frost. 2ndly. There is in many cases, in addition to the lateral motion, a vertical one from above downwards, also in proportion to the intensity of the frost. 3rdly. In other cases the vertical motion takes place in the opposite direction; that is, the branches move upwards as soon as frost sets in, and rise proportionately to the severity of the cold: *e. g. Acer Negundo*, etc. 4thly. In other woody plants the branches are observed to rise in mild weather, and to droop during severe frost: *e.g. Æsculus Hippocastanum*, etc.

Mr. J. E. HOWARD, London.—"Observations on the Present State of our Knowledge of the Species of *Chinchona*."

"The chief cause of the confusion in our knowledge of the *Chinchonas* has been the tendency to systematize without a full acquaintance with the details. I entirely disbelieve in all the so-called typical forms, and in all the attempts to classify and arrange them. The very best of these attempts seems to me to break down (as shown by Karsten), even as regards the exact limits of the genus itself, which blends by intermediate links with the other Chinchonaceous genera. I wish to direct especial attention to the spelling of the name of the genus, whether as *Cinchona* or as *Chinchona;* also to the name of an allied genus, whether as *Cascarilla* or as *Ladenbergia*. Nothing would tend so well to settle these questions as the free expression of opinion at a Botanical Congress. I would also point attention to the necessity of considering some as markedly distinct forms rather than as mere varieties having sub-varieties, until all ends in confusion. If this be admitted, the *Chinchona Pitayensis*, *C. lancifolia*, *C. purpurea*, *C. erythroderma*, *C. Pelletierana*, etc., would take their legitimate place; and I propose, by the side of these, to place the *C. Bonplandiana* vars. *colorata* and *lutea*, as representing a distinct form of the Loja bark. I would confine the name *Chinchona Condaminea* to the real *Quina primitiva* (if the having cured the Countess of Chinchon entitles it to this appellation), abolishing Pavon's barbarous name *Chahuarguera*. I have attempted to reduce into practical use Karsten's varieties of *C. lancifolia;* viz. *obtusifolia*, *obovata*, *tunila? angustifolia?* and *Almaguerensis?* The last three I venture myself to suggest. The varieties of *Chinchona Calisaya* I do not venture to do more than allude to, as I hope Dr. Weddell may further elucidate this subject. In conclusion, I will express my opinion that every well-defined region of the Andes has its own prevalent and characteristic *Chinchonas*, which are incapable of being reduced to any one typical form; and I believe that no one species has been clearly proved to prevail unchanged from end to end of the Chinchonaceous region; and I think that the plants which resemble each other in distant parts will be found analogous rather than identical."

Mr. Howard illustrated his paper by numerous specimens of barks, dried specimens of plants grown in India, and in the discussion which followed he said that he had succeeded in obtaining quinine from the bark of *C. officinalis*, which he cultivated in his own stove, and procured very nearly as much quinine as is yielded by bark of the same age in its native country. This is probably the first time that quinine has been extracted from bark grown in Europe.

Dr. WEDDELL, Poitiers, advocated the propriety of adhering to the spelling of the name of the genus employed by Linnæus; and at the meeting of Congress on the following day, Mr. Howard gave in his adherence to this view.

Professor Karl Koch, Berlin.—"Some Propositions with respect to Systematic Botany."

Three especial sources of difficulty beset the systematic botanist of our day. 1st. The confused nomenclature. 2nd. The scattered literature. 3rd. The distribution of great numbers of plants by nurserymen under fanciful names. One man can do but very little to remove these obstacles, but a Congress of botanists and horticulturists will be better able to effect the necessary changes and improvements.

Professor Koch proposed to obviate the confused synonymy by retaining the specific name first given; but as regards the generic name, to place that which recent investigation has adopted, first, and the one by which it was first described afterwards, in a parenthesis. If an author's name be given, it should be that of him who first described the plant. Our nomenclature begins with Linnæus, and hence all botanists prior to him are to be disregarded. Linnæus, for instance, describes *Ornithogalum luteum*, but Salisbury discovered characters of sufficient importance in this plant to justify him in making a new genus, *Gagea*. Our plants should therefore be called *Gagea lutea* (*Ornithogalum*), Linn.

Secondly, the scattered literature. Botanists nowadays write in German, French, English, Italian, etc., and in a large number of different periodicals, so that it becomes very difficult, or even next to impossible, for a man to make himself thoroughly acquainted with the literature of the subject. Professor Koch proposes, therefore, to select a number of botanists from various countries to examine and collate the separate publications of their several countries. A general editor is to be appointed in a European town where there is a good library, and all extracts are to be sent to him at that place. The general editor is to arrange these extracts scientifically, and to publish them in the Latin language.

Thirdly, as to the importation of plants by nurserymen. No disadvantage would ensue if the horticulturist were to adopt a provisional name in the first instance, and then apply to a botanist for the correct name, which could then be published; but in adopting this plan, there are two difficulties to be encountered. Gardeners would seldom take the trouble to change the provisional for the scientific name; and they would not always know which botanists studied particular families, or would not venture to trouble them. This ought, therefore, to be the task of a Botanico-Horticultural Congress.

Fourthly, many botanists have already devoted themselves to particular families, and it is to be desired that others should do the same. Horticulturists might then apply to these botanists for information, etc. Professor Koch then pointed out several instances where he has succeeded in carrying out the proposed reforms.

The Congress then adjourned until eleven o'clock on the following day, when the following papers were read:—

Dr. David Moore and Mr. A. G. More, Glasnevin.—"On the Climate, Flora, and Crops of Ireland."

The authors remarked upon the well-known humidity of the climate, and the singularly slight difference that there is between the summer and winter temperature; a difference that at Dublin is only 17½° Fahr., and on the west coast as small as 14°. Indeed, that of winter, they said, is as high as though the island lay 15 degrees nearer the equator. Hence the peculiarity of the Irish

flora, of which they gave a list of the more interesting species, and an accompanying map to show their geographical distribution. The humidity of the climate and its low summer temperature, they find to be unfavourable to the ripening of fruit and wheat, but such as to render Ireland the country of all Europe the best fitted for green crops and cattle grazing.

Appended were some interesting returns sent in by gardeners in the counties of Cork, Kerry, Galway, Mayo, Sligo, and Fermanagh, in answer to queries as to their success with fruit trees, and half-hardy shrubs and flowers. These returns agree in showing that the climate of the southern and western counties is ill-adapted to the growth of fruit, but favourable to that of evergreens.

Professor Lecoq, Clermont-Ferrand.—1. "Sur la culture et le mode d'emploi du Colchique Byzantin."

A description of the plant, and of the method of cultivating it, was given. The author recommended it for use in greenhouses and living rooms, its corms being concealed by *Lycopodium.*

2. "De la migration des plantes des montagnes."

The object of M. Lecoq was to show that the mountains of Auvergne have received their Alpine plants by the agency of birds and of wind, and not by a gradual migration during a supposed glacial period, the existence of which he denies altogether.

This district, he said, was, at the tertiary period, a vast plateau, with a mean altitude of 8–900 feet. Volcanic eruptions then inundated it, altered its soil and climate, and raised it in some places 1000 metres. "Then," said he, "clouds began to settle on the heights and snow to accumulate, and innumerable streams flowed from its icy summits, and by their murmurs seemed to call to a foreign vegetation to come to enjoy these happy conditions. The hospitable appeal was heard," etc.

The boreal species, with which alone we are concerned, and a list of which, about 104 in number, he gave, could not, he said, have arrived till after the volcanic elevation of the district, and they could only have come from the Alps, the Pyrenees, Lapland, or the mountains of Grenada. But as all these species are either Alpine or Pyrenean, with the one solitary exception of the *Arabis Cebennensis*, we may assume that these two great chains were the home from which they came as colonists to France.

The intermediate country is low and flat, and afforded them no resting-place; Darwin's theory of their progress by means of a glacial period he rejected; and concluded that they must therefore have been transported thither through the air, and mainly by birds of passage and violent storms of wind.

Mr. H. Howlett.—"On Night-covering and Shading of Plant and Forcing Houses."

The author's object is to combine shading with night covering by means of one contrivance fitted to the roof. He pointed out the necessity for the former, and the great advantages to be derived from the latter; and suggested that both may be secured, by fitting on the roof a series of louvre boards moved by levers. The suggestion was offered as affording ground for discussion, but had not been practically tested.

Mr. Howlett exhibited a model of the apparatus; in the discussion which followed, it was generally thought that the light would be too much excluded by the apparatus.

Mr. JAMES ANDERSON, Meadow Bank, Glasgow.—"Observations on the Temperature of Water, and its Effects upon Plant Cultivation."

Mr. Anderson considered that practical gardeners do not attach sufficient importance to the science of horticulture, but rely too much on routine, especially so with reference to the temperature of the air in plant-houses, and to that of the water supplied to the plants. He advocated the importance of employing water at least as warm as the air, or a little warmer, for watering tropical plants, especially Orchids.

This paper was followed by an animated discussion, approving of Mr. Anderson's views, in which Professors DAUBENY (Oxford) and REICHENBACH (Hamburg), and Messrs. BATEMAN, A. DE MORNEY, and HOWLETT took part.

M. KRELAGE, Haarlem.—"On the Names of Garden Varieties and their Confused Synonymy, with special reference to Bulbous and Tuberous-rooted Plants."

Dr. DICKSON, Edinburgh.—"On the Phylloid Shoots of *Sciadopitys*."

Prof. CASPARY did not fully coincide in the view propounded by Dr. Dickson.

Professor DE CANDOLLE, Geneva.—"Communication d'une mesure récente et très-exacte du diamètre de l'un des grands Sequoia de Californie."

The PRESIDENT exhibited a measure, on a long strip of paper, of the trunk of one of these gigantic trees, upwards of twenty-six feet in diameter. The rate of growth was carefully noted by actual counting of the annual rings, which amounted to about 1240.

Professor REICHENBACH, Hamburg, addressed the Congress on certain peculiarities in the structure of *Orchideæ*, and especially in regard to the branching of the spike.

In the discussion that ensued on this subject, Mr. BATEMAN said that he had seen a branched spike of *Odontoglossum grande*, and Dr. MASTERS said he also had met with a similar monstrosity in *Ophrys aranifera*.

Professor E. MORREN, Liége.—"Sur l'influence du gaz d'éclairage sur la végétation."

Mr. W. G. SMITH, London.—"The Corona of Narcissus."

Basing his argument upon analogous structures in other plants, Mr. Smith considered the corona of *Narcissus* to be made up of a series of confluent petal-stipules, having the normal six stamens and six petals as in the rest of the *Amaryllidaceæ*. See *ante*, p. 169.

The President then declared the Congress at an end, on which Mr. Bennett, British Museum, proposed, Professor Daubeny, Oxford, seconded, and Dr. Schulz-Bipontinus supported, a cordial vote of thanks to the President.

The following papers were sent to the Committee, but the two sittings of the Congress having been fully occupied with the above papers, they were unavoidably postponed:—

M. BAUMANN, Ghent.—1. "Éloge des expositions en Angleterre."

2. "Observations critiques sur celles de la Belgique."

3. "Réponse aux enthousiastes de l'arboriculture Belge."

M. BOMMER, Ghent.—"J'ai l'intention de traiter de la panachure (variegatio) et peut-être de la coloration des feuilles."

M. BOSSIN, Paris.—1. "Existe-t-il un signe constant et un caractère botanique extérieur qui permettent de reconnaître à première vue les semences qui doivent donner des fleurs doubles, parmi celles qui ne produisent que des individus à fleurs simples, comme le *Cheiranthus?* Quel est ce signe ou ce caractère?"

2. "Pour faciliter les relations entre les peuples de tous les pays, doit-on employer les adjectifs Latins pour désigner les variétés fixes de plantes potagères? En adaptant ces adjectifs aux noms génériques, quelle en sera la forme, une fois le principe adopté?"

3. "La Poire phénoménale désignée sous le nom de Belle Angevine, de Belle de Bruxelles, de Royale d'Angleterre, Bolivar, etc., est-elle Française, Belge, ou Anglaise? Connaît-on le lieu et le date de son origine, ainsi que le nom de son heureux obtenteur?"

Mr. W. BULL, Chelsea.—"On the Relation of Horticulture and Botany to Mankind in General."

Mr. CARROLL.—"On Garden Drainage."

The author, after alluding to the necessity for, and the advantage to be derived from cleansing cultivated ground, goes on to state, that no adequate provision is made to guard against drains being choked or stopped, and, in many cases, rendered quite useless, and even mischievous, by the intrusion of the roots of plants, and the deposit of oxide of iron, carbonate of lime, etc. The evil in question he proposes to remedy by laying a body of porous material beneath the drainage-pipes instead of above them; and this, because he has observed that roots always descend by preference to the bottom of any such porous substratum as they come in contact with.

Major TREVOR CLARKE, Daventry.—"On a Certain Phenomenon of Hybridism in the Genus *Matthiola.*"

Mr. B. CLARKE, London.—"On the Floral Envelopes of *Lauraceæ.*"

The author regards the floral envelopes of *Lauraceæ* as double, consisting of a trimerous calyx and corolla, and supports his views by a reference to those of *Laurus* itself, the fourth sepal of which he considers to be internal, and be-

longing to the petaline series, the other two divisions of that series being converted into stamens. He refers to the near affinity of *Hernandia* (recognised by all authors from Jussieu downwards), and of *Gyrocarpeæ* (pointed out by Robert Brown, and adopted by all subsequent writers), and to the evident relation of the last-named family to *Combretaceæ* (of which indeed Lindley regarded them as merely a section), and derives, from a comparison with all these plants, further arguments in support of the correctness of his notion. Evidences of near relationship are also deduced from the structure of their ovaries and the attachment of their ovules, and the author finally arrives at the conclusion that *Lauraceæ* are "*Combretaceæ*, with a superior ovary and sepaloid petals."

Mr. W. Earley.—"On the Preparatory Formation of Trained Wall-fruit Trees."

The writer sets forth that the present system of pruning trained trees in the nurseries is objectionable, on the ground that the too free use of the knife injures and often destroys the constitution of the tree when in a young state, and is one cause of wall-trees shrivelling and dying. It is also the cause of a too gross after-growth, and consequent unfruitfulness. He advocates, in place of the present system, summer pinching, which attains the end sought in less time, and produces a sounder tree, more favourable to removal.

Professor Goeppert, Breslau.—1. "On the Arrangement of Alpine Plants in our Gardens."

The author condemns the indiscriminate planting, and total absence of order or arrangement of the alpine and arctic plants cultivated in our gardens, and considers that one object in our botanic gardens should be the illustration of botanical geography. About 450 of the flowering plants of Germany and Switzerland may be looked on as truly alpine, and of these about two-thirds are grown in the Breslau Botanic Garden; some in pots, others planted out in a space of about a Prussian acre in extent, planted out amongst various kinds of stone and rock in eight groups, as shown in the accompanying photographs. The red snow, ***Protococcus nivalis***, grows here in a hollow slab of granite. The plants are arranged in groups according to the levels at which they grow in their native habitats. In this way the relation of vegetation to altitude may be seen at a glance.

2. "Palæontology and our Botanic Gardens."

The author draws attention to the intimate connection between recent and fossil botany, and gives an account of the steps he has taken in the Breslau Botanic Garden to illustrate the latter, by forming a model section of the coal formation, with its characteristic plants. In a similar way the enormous trunk of the ***Pinites Protolarix***, discovered and described by the author, serves as a representative of the tertiary formation. The paper is accompanied with photographs.

Mr. S. Hibberd, London.—"On the Naming of Plants."

"The importance of botanical nomenclature to science, art, and literature.—Classical origin of many of the names of plants.—Names of plants divided into two classes, natural and artificial.—Prevalence of artificial names at the present time; objections to them.—Proposed revision of botanical lists.—Proposed establishment of a board of botanical nomenclature."

Dr. HILDEBRAND, Bonn.—"On the Necessity of Insect Agency in the Fertilization of *Corydalis cava.*"

Dr. Hildebrand concludes from his experiments, 1st. That the flowers of *Corydalis cava*, when protected from insects, and thus acted on by their own pollen, form no capsules. 2nd. That fruit is very seldom formed when the flowers of the same raceme are crossed with each other. 3rd. By the crossing of flowers on different individual plants alone, is perfect fertilization insured.

M. VAN HULLE, Ghent.—"Rational Method of Pruning."

The writer assumes that the fruits produced in England are abundant, but small, and usually produced by trees left to their natural growth, owing to which they are neither so handsome in form nor so productive as they might be. Their productiveness in England, such as it is, is due rather to the skill displayed and cost incurred in managing the ground than on the management of the trees. The writer assumes that the English prune their trees to make them grow, without properly considering regularity of form or size of fruit.

He recommends pruning to obtain symmetrical trees and large fruit, by recognizing the character of the different branches; as, for instance, whether fruit-bearing or wood-bearing, and treating them accordingly, in opposition to the system of treating all alike, which he calls the old system, and speaks of it rather as "pruning without system." The old plan leaves nature to form wood or fruit branches at will; he would so control nature as to form either at pleasure.

Professor KICKX, Ghent.—"Je serai heureux surtout d'y voir traiter les questions de physiologie spécialement appliquées à la cryptogamie."

M. LAHAYE, Paris.—"Sur la conservation des fruits."

The author says it is impossible to preserve fruits out of their season if the trees which produce them are in bad health or condition.

M. MAS, Bourg.—"De la direction à donner à la recherche des nouvelles variétés d'arbres à fruit."

Dr. MASTERS, London.—"Double Flowers, etc."

Professor E. MORREN, Liége.—"Sur les fleurs doubles."

Dr. FERD. MUELLER, Melbourne.—"Advocates the Attempt to Cultivate the Cinchona in the South of Europe."

Professor PARLATORE, Florence.—"Le specie di cotoni."

Professor PYNAERT, Ghent.—"Des moyens de faire naître des variétés nouvelles chez les arbres à fruits et d'en diriger la création. Examen des divers procédés usités. Sélection, hybridation, choix des graines, influence du mode de culture des plantes de semis sur la constitution des variétés."

Mr. RIVERS, Sawbridgeworth.—1. "On the Culture of Fruit in Unheated Glass Structures."

A brief history of orchard-houses, the latest improvements in their construction and ventilation. A short account of the kinds of trees to plant in them. A new method of forming the borders for the reception of the trees. An improved mode of cultivating Apricots under glass so that crops are ensured. The culture of Cherries in orchard-houses, and the stocks proper for them, is entered into. The cultivation of the finer kinds of American Apples in orchard-houses is recommended, and that of Pears and Plums slightly touched on.

2. "On Dessert Orange Culture in England."

This paper describes the perfect success of the culture of Oranges for some seasons past. The method by which they are made to ripen their fruit perfectly in about eight months, so that ripe Oranges may be placed on the table immediately after the late kinds of Peaches or Nectarines. The most eligible kinds of Oranges for English culture are named. The outlines of their management, and the proper temperature of the Dessert Orange house are given.

Professor SCHULTZ BIPONTINUS, Diedesheim.—"On Compositæ."

Professor SCHULTZ SCHULTZENSTEIN, Berlin.—"On the Presence and Source of Nitrogen in Turf or Peat, with reference to its Use as a Manure for Plants."

The author in this paper controverts the opinion of most chemists, that plants derive the carbon and nitrogen which they contain from the air and not from the soil. "Practical experience contradicts this theory." The author proposes to use turf as a manure, from the quantity of nitrogen that it contains, and which obviates the necessity of using animal manure. The nitrogen of the turf originates from the remains of animal life in it, such as infusoria, worms, mollusca, etc. Turf does not decompose so quickly as animal manure, but it is on that account the more efficacious. The author has not found any advantage in adding bone-dust (phosphate of lime) to the turf, which, indeed, contains a sufficient quantity of that substance.

P. H. VON SIEBOLD, Leyden.—1. "Sur le Cèdre du Japon, *Cryptomeria Japonica*, Don."

2. "Sur les plantes nouvelles et rares d'ornement et usuelles du Japon, cultivées dans mon jardin d'acclimatation à Leiden."

Signor TRIANA, Kew.—"Sur les manuscrits et magnifiques dessins de l'expédition botanique du nouveau royaume de Grenade, dirigée par Mutis et qui sont conservés à Madrid."

Mr. ROBERT WARNER, Broomfield, Chelmsford.—"On Cool Vinery Orchids."

M. HERMANN WENDLAND, Herrenhausen.—"Note on the Culture of Palms."

The author, in this paper, insists upon the paramount necessity of supplying Palms with an abundant supply of water.

Mr. TUFFEN WEST, London.—"On the Structure of the Testa of the Seed of *Solanaceæ*."

Details a series of microscopical observations on the outer covering of seeds. Mr. West describes the peculiarity in the cell structure of the testa in different genera, and shows that such structures afford constant characters. A peculiar structure is present in the testa of many *Solanaceæ*. It is a form of barred tissue, constituting a support to the *lateral* walls of the cells; in which portion of the cells the primitive membrane is found in mature seeds to have disappeared more or less completely. The *inner* walls are greatly thickened by horny and even crustaceous deposit; in addition to their (usually) very sinuous outline, the edges of the *inner* walls are also elongated by undulation; from these edges processes arise which form a fringe having the appearance of hairs. By examination of numerous examples this structure proves to be a form of barred tissue, which, by various intermediate conditions, passes in *S. Indicum* and *S. jasminoides* into a reticulate tissue. The author is very desirous to procure seeds for microscopic examination, the results hitherto obtained promising to possess interest and value in proportion to the extent to which they are systematically carried out.

Dr. WIGHT, Reading.—"On the Phenomena of Vegetation in the Indian Spring."

We cannot close the record of this singularly successful Congress without referring to the other events of the week, in which the members of the Congress took an active part. First of all there was the flower show, which was a magnificent success. The grouping of the plants on the winding turf terraces produced a marvellously beautiful effect, while the rarity, excellence, or quantity of the individual specimens has never been equalled. The public thoroughly appreciated the extraordinary exhibition, and every day thronged it. Instead of four, the exhibition was kept open for nine days. A great banquet was held at the Guildhall on Tuesday, presided over by the Lord Mayor, to which one hundred foreign guests were invited. On the Wednesday evening the extensive suite of apartments at the Kensington Museum was crowded with a fashionable company, among whom were all the foreign visitors to the exhibition and Congress. On Thursday upwards of five hundred gentlemen dined at St. Martin's Hall, under the presidency of Lord Henry Lennox; and the President and Council of the Linnean Society invited the most distinguished foreign visitors to the anniversary dinner of that Society on the same day. The gardens of the Zoological and of the Royal Botanic Societies were freely opened to all who had Congress tickets. Special facilities were given to the members of the Congress for visiting Kew Gardens, and a large number were hospitably entertained by Dr. Hooker, the Director of the Gardens. But it would be impossible to enumerate all the more or less public and the private entertainments which will cause the week to be long remembered alike by British and foreign botanists, for the amount of pleasure and business, of hospitality given and hospitality received, which was compressed into it.

W. Fitch, del. et lith.

Vincent Brooks, Imp.

ON *LEUCOJUM VERNUM*, *Linn.*, AS A BRITISH PLANT.

By J. C. Mansel, Esq.

(Plate XLIX.)

In consequence of a communication from Mr. Hardy, of Manchester, I made an excursion, in the beginning of March this year, in the neighbourhood of Bridport, Dorset, in search of *Leucojum vernum*, Linn., which had not hitherto been recorded as growing wild on this side of the English Channel. I was successful in my search, and found it in great abundance. To substantiate its claim to be considered as a British plant, and not one artificially introduced, it may be well to consider its local position in Dorsetshire in connection with its distribution on the Continent. Here it grows on the banks and sides of a thick hedgerow on the declivity of one of the various Greensand heights which, as usual in that part of the country, overlie the Lias. The surrounding lands are arable, the soil being loamy from its admixture with the Greensand, and the drainage is conveyed by a watercourse which follows the line of hedge on which the *Leucojum* grows. At the bottom of the valley, the hedge merges into a narrow belt of copse, where the showy corolla of this rare plant mingles with *Chrysosplenium oppositifolium*. I traced it, in more or less profusion, for upwards of a quarter of a mile by the side of the same watercourse, to the termination of the cultivated land. Its sudden disappearance is probably owing to the change of soil, which here becomes a thick, impervious, stubborn clay. I cursorily examined a small wood on the opposite side of the valley, but found there no traces of the plant. There is no reason, however, for concluding that it is confined to this remote valley, where no vestige of human habitation occurs, except two modern labourers' cottages near the summit of the hill, and which are not likely to have been the artificial cause of its introduction. The plant grows in sufficient abundance to resist the onslaught of an army of Vandal invaders, who, alas! too often ruthlessly extirpate rare and choice plants. It grows robustly, and appears to be surrounded with conditions most favourable for a healthy and vigorous propagation. With regard to its European distribution, Germany is pre-eminently its centre; from thence it radiates in all directions, preferring apparently the subalpine regions. It is profusely distributed through-

out Switzerland, and penetrates into the north-eastern provinces of France, as Alsace and Lorraine. It is recorded by Brebisson in his 'Flore de la Normandie,' as having been found at Auvillars-en-Auge, which, pointing in the direction of Dorsetshire, gives a colour of probability to its British claim. It is not unfrequent further north, in the Belgic provinces.

Not many years since, the *Simethis bicolor*, Kunth, was found for the first time near Bournemouth, and the *Gladiolus Illyricus*, Koch, near Lyndhurst, Hants. Although no other English stations are recorded for these plants, they are both justly adopted by botanists as true additions to our flora, and their geographical distribution entirely favours this opinion, as they are frequently met with on the opposite side of the Channel.

Leucojum æstivum, Linn., is entered in Mr. Watson's 'Cybele Britannica' as a Dorsetshire plant, probably on the authority of the late Dr. Salter, who specifies it as growing within eight miles of Poole, but gives no locality. After a careful study of the Dorsetshire flora, I am bound to say, although Dr. Salter's list is most valuable, it it is not altogether to be relied upon. I have not seen *Leucojum æstivum* growing in the county.

The following description will assist in determining the new plant from *L. æstivum*, from which, however, it obviously differs in having only one flower on the scape :—

Leucojum vernum, Linn. Flower solitary, large, and drooping; spathe linear-oblong, as long as the included pedicel; perianth-segments obtusely mucronate. Style terminating in an apiculate club.

PIPERACEÆ NOVÆ.

Auctore CASIMIR DE CANDOLLE.

(*Concluded from page* 167.)

TRIB. II. *PIPEREÆ.*

Genus PIPER.

** *Bractea truncato-peltata.*

P. subflavum; foliis brevissime petiolatis ovato-lanceolatis apice acuminatis acutis basi inæqualiter cordulatis utrinque et subtus

densius molliter flavicanti-pubescentibus siccis subcoriaceis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{2}$ alt. nervos alternos 4–5 subadscendentes supremos ad apicem ductos mittente, petiolo pedunculoque dense flavicanti-hirsutis, bracteæ pelta triangulari margine flavicanti-pubescenti, ovario puberulo.—In Novæ-Granatæ prov. de Pasto Ortega, alt. 1500 (Triana, Exsic. n. 23).—Frutex, ramuli teretes retrorsum flavicanti-hirsuti, foliorum limbi 0,145 longi 0,055 lati, petioli 0,004 longi.

P. confusum; foliis brevissime petiolatis elliptico-lanceolatis apice acutis mucronulatisque e medio basin versus subattenuatis basi ima inæqualibus obtusis supra scabris sæpe bullatis et verruculis albis obsitis ætate lævigatis subtus ad nervos appresse pilosis siccis subcoriaceis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{2}{3}$ alt. nervos alternos supremos fere ad apicem ductos mittente, pedunculo petiolum 3–4-superanti, amentis mucronulatis, bracteæ pelta semilunari-triangulari margine dense pubescenti, ovario vertice glanduloso-pubescenti.—In insula Cuba (Wright, n. 773 et 494, Herb. Cand.).—Ramuli teretiusculi hirsuti, nodi tumidi, foliorum limbi 0,09–0,11 longi 0,04–0,05 lati, petioli 0,005 longi.

P. rugulosum; foliis brevissime petiolatis ellipticis apice breviter attenuatis acutis vel acutiusculus basi inæqualiter obtusis junioribus supra subtiliter pubescentibus subtus ad nervos præsertim appresse pubescentibus siccis subcoriaceis opacis, centrali nervo ad apicem ducto utrinque ad $\frac{1}{2}$ alt., nervos alternos 3–4 subadscendentes mittente pedunculo petiolum duplo superanti puberulo, amento mat. quam folium duplo breviori, bracteæ pelta triangulari margine pubescenti.—In Novæ-Granatæ prov. de Pasto, alt. 2700 (Triana, n. 46, Herb. Cand.).—Frutex, rami glabri sicci plicato-rugulosi, ramuli juniores pilis recurvulis pubescentes, nodi tumidi, foliorum limbi 0,05 longi 0,025 lati, petioli 0,003 longi.

P. pedicellare; foliis brevissime petiolatis elliptico-oblongis apice attenuato-acuminatis acutis basi attenuatis acutis utrinque glabris siccis membranaceis subopacis, centrali nervo ad apicem ducto utrinque fere ad apicem nervos subopposités 15 patulo-subadscendentes venis fortioribus intermixtos mittente, pedunculo petiolum æquanti, amento florenti quam folium multoties breviori, bracteæ pelta triangulari margine dense aureo-pubescenti, bacca obpyramidato-trigona.—In Novæ-Granatæ prov. Barbacoas, alt. 50 (Triana, n. 16).—Frutex,

ramuli glabri striati, foliorum limbi 0,20 longi 0,07 lati, petioli 0,008 longi.

P. trigonum; foliis breviter petiolatis oblongis apice acuminatis acutis basi æqualiter attenuatis acutis supra glabris subtus ad nervos præsertim appresse puberulis siccis membranaceis opacis, centrali nervo ad apicem ducto ad $\frac{3}{4}$ alt. nervos alternos utrinque 5 subadscendentes supremos ad apicem ductos mittente, pedunculo pubescenti petiolum fere duplo superanti, amento quam folium dimidio-breviori, bracteæ pelta triangulari margine ciliata, bacca obovato-trigona vertice glanduloso-puberula.—In Novæ-Granatæ prov. Barbacoas, alt. 718 (Triana, n. 44, Herb. Cand.).—Frutex, ramuli sicci subtetragoni pilis recurvulis pubescentes, nodi tumidi, foliorum limbi 0,13 longi 0,045 lati, petioli 0,006 longi.

P. villosum; foliis brevissime petiolatis obovato-lanceatis apice protracto-acuminatis acutis basin versus æqualiter subattenuatis basi cordulatis supra bullatis supra ad bullas subtus ad nervos venasque villosis, pilis longis siccis membranaceis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. nervos utrinque 6 subalternos subadscendentes mittente, pedunculo petiolum duplo superanti, amento quam folium multoties breviori, bracteæ pelta nuda, bacca obovato-trigona vertice glandulosa.—In Novæ-Granatæ prov. Barbacoas, alt. 890 (Triana, n. 6, Herb. Cand.).—Frutex, ramuli juniores villosi, foliorum limbi 0,18 longi 0,09 lati, petioli 0,008 longi.

P. fistulosum; foliis breviter petiolatis oblique ovato-ellipticis apice attenuato-acutis basi subæqualiter subrotundatis supra glabris subtus ad nervos pubescentibus siccis membranaceis subopacis, centrali nervo ad apicem ducto ad $\frac{1}{3}$ alt. nervos utrinque 4 alternos subadscendentes supremos supra medium ductos mittente, pedunculo petiolum æquanti, amento folium æquanti, bracteæ pelta triangulari margine aureo-pubescenti, bacca tetragona glabra.—In Novæ-Granatæ prov. Pasto, alt. 2010 (Triana, n. 25, Herb. Cand.).—Frutex, rami glabri intus fistulosi sicci nigri, foliorum limbi 0,1 longi 0,055 lati, petioli 0,01 longi.

P. petiolare; foliis longe petiolatis subrotundato-ovatis apice attenuatis acutiusculis basi rotundato-truncatis supra glabris subtus ad nervos et venas appresse pubescentibus siccis rigidulis opacis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. nervos utrinque 7 alternos subadscendentes supremos ad apicem ductos mittente, pedunculo quam petiolum

breviori, bracteæ pelta semilunari margine dense et dorso densius pubescenti.—In Novæ-Granatæ prov. Pasto, alt. 1600 (Triana, n. 53).—Frutex, ramuli glabri, foliorum limbi 0,16 longi 0,11 lati, petioli 0,055 longi.

P. cordatum; foliis subsessilibus oblongo-ovatis apice attenuatis acutis basi æqualiter cordatis utrinque glabris margine ciliolatis siccis membranaceis, centrali nervo ad apicem ducto ad apicem nervos utrinque 8–10 patulo-adscendentes mittente, pedunculo brevissimo, bracteæ pelta triangulari-subquadrangulari margine pubescenti.—In Peruvia orientali prope Tarapoto (Spruce, n. .4847, Herb. Kew).—Foliorum limbi 0,23 longi, media parte 0,11 lati.

P. ottoniæfolium; foliis brevissime petiolatis elliptico-oblongis apice brevissime acuminatis acutis basi subinæqualiter cordulatis utrinque glabris siccis opacis, centrali nervo ad apicem ducto ad $\frac{1}{6}$ alt. utrinque nervos adscendentes supremos ad apicem ductos mittente, pedunculo petiolum fere duplo superanti, bracteæ pelta triangulari margine dense pubescenti.—In Novæ-Granatæ prov. Choco, alt. 170 (Triana, n. 32, Herb. Cand.), et Barbacoas (Triana, n. 31).—Frutex, ramuli glabri, nodi tumidi, foliorum limbi 0,15 longi 0,06 lati, petioli 0,003 longi.

P. Fendlerianum; foliis petiolatis elliptico-lanceolatis apice acutis basi æqualiter subattenuatis supra glabris subtus ad nervos hirtellis siccis firmo-membranaceis subopacis, centrali nervo ad apicem ducto ad $\frac{2}{3}$ alt. nervos utrinque 4–5 alternos subadscendentes mittente, pedunculo petiolum circit. æquanti, amento mucronulato, bracteæ pelta triangulari margine pubescenti.—In Venezuela prope coloniam Tovar (Fendler, n. 1140, Herb. Cand.).—Frutex, ramuli glabri nudi tumiduli, foliorum limbi 0,11–0,14 longi 0,35–0,75 lati, petioli 0,01 longi.

P. Kappleri; foliis brevissime petiolatis oblongo-elliptico-lanceolatis apice acuminatis acutis basi æqualiter rotundatis supra glabris subtus ad nervos præsertim sparse hirtellis, pilis recurvulis siccis membranaceis opacis, centrali nervo ad apicem ducto ad $\frac{2}{3}$ alt. nervos utrinque 6 alternos subadscendentes supremos patulo-adscendentes mittente pedunculo petiolum duplo superanti, amento quam folium multotie, breviori, bracteæ pelta triangulari margine pubescenti, baccis obovatis vix angulosis discretis.—In Surinam (Kappler, n. 1855, Herb. Franc.)—Frutex?, ramuli sicci nigri pilis recurvulis hirtelli, foliorum limbi 0,13 longi 0,035 lati, petioli 0,005 longi.

P. montanum; foliis longe petiolatis subrotundato-ovatis apice subattenuatis acutiusculis, basi cordatis utrinque glabris siccis rigidulis 13-plinerviis, centrali nervo ad apicem ducto ad $\frac{1}{3}$ alt. utrinque nervos 3 suboppositos subadscendentes mittente, lateralibus nervis utrinque 3 basi solutis patulo-subadscendentibus, amento quam folium breviori, bracteæ pelta triangulari margine aureo-villosa, bacca obpyramidato-tetragona.—In Novæ-Granatæ prov. Marequita monte Quimdiu, alt. 2200 (Triana, n. 14, Herb. Cand.).—Frutex, ramuli glabri, foliorum limbi 0,21 longi 0,17 lati, petioli 0,05 longi.

P. multiplinervium; foliis petiolatis ovatis apice breviter acuminatis acutis basi subrotundato-rotundatis basi ima acutiusculis utrinque glabris siccis membranaceis opacis septuplinerviis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. utrinque alternatim nervum adscendentem ad apicem ductum mittente, lateralibus nervis utrinque 4 e basi solutis adscendentibus, amento quam folium paulum breviori, bracteæ pelta semilunari margine pubescenti.—In Novæ-Granatæ prov. Barbacoas, alt. 100 (Triana, n. 27, Herb. Cand.).—Frutex, ramuli glabri, nodi haud tumiduli, foliorum limbi 0,095 longi 0,065 lati, petioli 0,012 longi.

P. Bogotense; foliis petiolatis ovatis apice acuminatis acutis basi subæqualiter subrotundatis supra glabris subtus ad nervos hirtellis siccis rigido-membranaceis 11-plinerviis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. utrinque nervos 2 alternos adscendentes supremos ad apicem ductos mittente, lateralibus nervis utrinque 3 e basi solutis, bracteæ pelta triangulari margine aureo-pubescenti.—In Novæ-Granatæ prov. Bogotá, alt. 3700 (Triana, n. 50, Herb. Cand.), et prov. Marequita monte Quimdiu, alt. 2200 (Triana, n. 20, l. c.)—Frutex, ramuli juniores hirsuti, nodi tumidi, foliorum limbi 0,16 longi 0,095 lati, petioli 0,01 longi.

P. cinereum; foliis longiuscule petiolatis e basi parum inæqualiter profunde cordata suboblique lanceolatis acutis supra pulverulento-puberulis subtus subtiliter ad nervos præsertim hirtellis siccis rigidulo-membranaceis 11-nerviis, amento folium parum uperanti, bractea cucullato-spathulata, dorso et margine villosula vertice subconchæformi.—In Novæ-Granatæ prov. Choco (Triana, Herb. Cand.). —Frutex, ramuli pilis recurvulis pulverulento-hirtelli, nodi vix tumiduli, foliorum limbi 0,08 longi 0,05 lati, petioli 0,025 longi.

*** *Bractea cucullata.*

P. glanduligerum; foliis breviter petiolatis oblongo-ovato-ellipticis apice longe acuminatis acutis basi æqualiter attenuatis acutiusculis utrinque glabris siccis rigidis opacis, centrali nervo ad apicem ducto ad apicem utrinque nervos 12–14 alternos subpatulo-adscendentes mittente, amento quam folium dimidio-breviori, bractea spathulato-inflexa vertice peltam triangularem angulo anteriori carnosulo glanduligeram simulanti.—In Venezuela prope coloniam Tovar (Fendler, n. 1137 et 2400, Herb. Cand.), Caracas (Bushel, Herb. Kew.), Columbia (Hartweg, n. 1400, Herb. Kew.).—Frutex, ramuli glabri, nodi tumidi, foliorum limbi 0,15 longi 0,055 lati, petioli 0,01 longi.

P. Tequendanense; foliis elliptico-lanceatis apice acuminatis acutis basi inæqualiter attenuatis acutiusculis obtusisve supra glabris subtus ad nervos molliter pubescentibus siccis membranaceis, centrali nervo ad apicem ducto utrinque ad $\frac{3}{4}$ alt. nervos alternos 4–5 subadscendentes supremos ad apicem fere subtiliter ductos venasque fortiores mittente, bractea obovato-cucullata vertice inflexo dorso villosa.—In Novæ-Granatæ prov. Tequendana, alt. 890 (Triana, n. 35 et 39, Herb. Cand.).—Frutex, ramuli glabri, nodi tumiduli, foliorum limbi 0,12 longi 0,045 lati, petioli 0,02 longi.

P. verruculosum; foliis brevissime petiolatis oblongo-subovato-lanceolatis apice longiuscule acuminatis acumine obtusiusculo mucronulato basi inæqualiter subrotundatis subsemicordatis utrinque glabris siccis rigidulo-membranaceis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. utrinque nervos 4–5 alternos subadscendentes supremos ad apicem fere ductos mittente, amento folium subæquanti, bractea oblongo-cucullata vertice inflexo peltam triangularem ciliolatam simulanti, bacca obpyramidato-tetragona vertice subtiliter puberula.—In Costa Rica ad montem Candelaria (Hoffmann, n. 8, Herb. Ber.).—Frutex, ramuli glabri verruculis albidis scabridi, nodi tumidi, foliorum limbi 0,1 longi 0,045 lati, petioli 0,003 longi.

P. decurrens; foliis breviter petiolatis lanceolatis apice acuminatis acutis mucronulatisque basi æqualiter cuneato-acutis in petiolum subdecurrentibus utrinque glabris siccis subcoriaceis opacis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. utrinque nervos 4 subadscendentes alternos supremos ad apicem ductos mittente, amento quam folium dimidio-breviori, bractea oblongo-subobovato-cucullata vertice carnosulo subinflexo peltam angustam margine ciliolatam simulanti.—In Costa Rica

ad mont. Candelaria (Hoffmann, n. 853, Herb. Ber.).—Frutex, ramuli glabri foliorum limbi 0,12 longi 0,045 lati, petioli 0,008 longi.

P. Venezuelense; foliis breviter petiolatis amplis oblongo-ellipticis apice acuminatis acutis basi subæqualiter obtusiusculis supra glabris subtus ad nervos hirtellis siccis firmulis, centrali nervo ad apicem ducto ad $\frac{1}{2}$ alt. nervos utrinque 6 oppositos subadscendentes supremos ad apicem ductos mittente, amento quam folium dimidio breviori, bractea cucullata vertice inflexo peltam simulanti, bracteis rachis ope extenuati inter se junctis et inter flores productis, bacca obpyramidato-tetragona vertice margine extenuato.—In Venezuela inter Agua Blanca et Cumbote, alt. 5000 (Fendler, n. 2572, Herb. Cand.).—Frutex, ramuli glabri, nodi tumidi, foliorum limbi 0,2 longi 0,15 lati, petioli 0,012 longi.

P. Spruceanum; foliis brevissime petiolatis oblongo-lanceolatis obtusiusculis basi æqualiter cuneatis supra subtusque dense pilosis siccis membranaceis, centrali nervo ad apicem ducto nervos ad apicem utrinque 8–10 subadscendentes, mittente, petiolo villoso pedunculo petiolum duplo superanti, bractea cucullata apice inflexa peltam simulanti.—In Peruvia orientali prope Tarapoto (Spruce, n. 4072, Herb. Kew.).—Ramuli villoso-pilosi, nodi tumiduli, foliorum limbi 0,17 longi 0,05 lati, petioli 0,01 longi.

P. aculeatum; foliis breviter petiolatis oblongo-subovato-lanceolatis apice acuminatis subulatisque basi æqualiter acutiusculis obtusiusculisve supra glabris subtus ad nervos sparsissime hirtellis siccis membranaceis centrali nervo ad apicem ducto ad $\frac{2}{3}$ alt. nervos utrinque 4 subadscendentes mittente, pedunculo petiolum superanti, amento quam folium multot. breviori, bractea cucullata apice inflexa peltam margine ciliolat. triangul. fingenti.—(Spruce, n. 2887, Herb. Franc. Herb. indistincta.)—Suffrutex?, ramuli glabri, nodi vix tumidi, foliorum limbi 0,085 longi 0,025 lati, petioli 0,003–0,005 longi.

P. Panamense; foliis brevissime petiolatis elliptico-lanceolatis apice breviter acuminatis supra glabris subtus ad nervos puberulis siccis subcoriaceis, centrali nervo ad apicem ducto ad apicem fere utrinque nervos 4–5 patulo-adscendentes venasque fortiores mittente, bractea cucullata apice inflexo peltam triangularem margine ciliolatam subfingenti.—In isthmo Panamá prope Chagres (Fendler, n. 270, Herb. Kew.).—Ramuli subglaucescentes, nodi tumidi, foliorum limbi 0,1 longi 0,055 lati, petioli 0,005 longi.

P. pachystachyon; foliis longiuscule petiolatis ovatis vel elliptico-

ovatis supra bullatis subtus villosis siccis coriaceis, centrali nervo ad apicem ducto utrinque nervos 5–6 suboppositos versus marginem adscendentes mittente, bractea oblongo-subcucullata sessili utrinque vertice obtuso excepto nudo glanduloso-puberula.—In Columbia (Triana et Linden, n. 162, Herb. Kew.) et Bogotá, alt. 2700 (Triana, n. 52), et Costa Rica (Hoffmann, n. 856, Herb. Reg. Ber.).—Ramuli appresse puberuli, nodi tumidi, foliorum limbi 0,1–0,12 longi 0,065–0,08 lati, petioli 0,02 longi.

P. inæquale; foliis petiolatis oblongo-lanceatis apice acuminatis acutis basi inæqualiter rotundatis subcordatis utrinque glabris siccis subcoriaceis, centrali nervo ad apicem ducto ad $\frac{2}{3}$ alt. nervos alternos lat. min. 5 maj. 6 subadscendentes supremos fere ad apicem ductos mittente, bractea cucullata, vertice inflexo peltam margine ciliolatam subsimulanti.—In Guyana ? (Herb. Rich. in Herb. Francov.).—Frutex, ramuli glabri, nodi tumiduli, foliorum limbi 0,18 longi 0,075 lati, petioli 0,03 longi.

P. cordulatum; foliis petiolatis oblongo-lanceolatis basi subæqualiter cordulatis utrinque glabris siccis rigidis, centrali nervo ad apicem ducto ad apicem utrinque nervos 11–13 alternos mittente, pedunculo quam petiolum breviori, bractea cucullata vertice peltam triangularem simulanti.—In isthmo Panamá prope Chagres (Fendler, n. 267, Herb. Kew.).—Ramuli glabri, nodi haud tumidi, foliorum limbi 0,14 longi 0,0045 lati, petioli 0,02 longi.

P. calceolarium; foliis petiolatis e basi cordata ovato-lanceolatis supra crebre bullatis pilosisque subtus molliter pubescentibus lacunosis siccis membranaceo-coriaceis 5–7-nerviis, centrali nervo ad apicem ducto supra basin nervos utrinque 2 alternos subadscendentes mittente, lateralibus nervis utrinque 2–3 subadscendentibus, petiolo villoso pedunculum villosum superanti, amento mucronato, bractea calceoliformi subtus et margine subvillosa.—In Columbia (Triana et Linden, n. 339, Herb. Kew.).—Rami appresse villosi, nodi tumidi, foliorum limbi 0,07 longi 0,05 lati, petioli 0,015 longi.

a. foliis rameis 0,13 longis 0,06 latis, ramis retrorsum villosis.—In Novæ-Granatæ prov. Antioquia, alt. 1300 (Triana, n. 21, Herb. Cand.).

P. subfuscum; foliis longiuscule petiolatis rotundato-ovatis apice subattenuatis acutis basi subæqualiter profunde cordatis supra parce pilosulis subtus dense fusce pubescentibus siccis rigidulis 9-nerviis,

centrali nervo ad apicem ducto ad $\frac{3}{4}$ alt. nervos utrinque 4 alternos patulo-adscendentes supremos ad apicem ductos mittente, lateralibus nervis utrinque 4, pedunculo petiolum æquanti, amento crasso folium superanti, bracteæ calceoliformis vertice carnosulo margine ciliolato.—In Costæ Ricæ regione sylvatica ad Alto de la Cruz (Hoffmann, n. 544, Herb. Reg. Ber.).—Frutex vel arbor 6 ped. (Hoffmann, l. c.), ramuli juniores dense fusce pubescentes, foliorum limbi 0,32 longi 0,24 lati, petioli 0,04 longi.

b. Stigmata 3. *Stam. plerumque* 6, *ovario incomposito raro* 3.

P. Victorianum; foliis breviter petiolatis ellipticis vel lato-ovato-ellipticis apice acuminatis apice imo obtusiusculis basi subattenuato-acutiusculis supra glabris subtus ad nervos subtiliter hirtellis siccis firmule membranaceis 5–7-nerviis, pedunculo petiolum subsuperanti, amento quam folium $\frac{1}{3}$ breviori, bractea obovato-cucullata apice inflexa, stam. 5, bacca ovato-acuta basi rhachi subimmersa, rhachis foveolis hirto-puberulis.—In Venezuela prope Victoria, alt. 2000 (Fendler, n. 1139, Herb. Cand.).—Frutex, nodi tumidi, foliorum limbi 0,11 longi 0,06 lati, petioli 0,008 longi.

P. Lindenianum; foliis brevissime petiolatis elliptico-lanceolatis utrinque acutis utrinque glabris siccis rigidis quintuplinerviis, centralibus nervis 3 paulo supra basin solutis, pedunculo petiolum superanti, amento mat. folium æquanti subremotifloro, rachi subtiliter hirtella, bractea ovato-concava sessili, stam. 3, duo lat. uno postico.—In Cuba prov. Pilos de las Handones (Linden, n. 1177, Herb. Cand.).—Frutex, nodi tumidi, foliorum limbi 0,055 longi 0,025 lati, petioli 0,003 longi.

P. Tiguanum; foliis petiolatis ovato-lanceolatis apice acuminatis acutis basi æqualiter rotundatis truncatisve cordulatisve utrinque glabris siccis membranaceis septemnerviis, nervis 3 centralibus ad apicem ductis, amento folium superanti, bractea obovato-spathulata, stam. 5, bacca ovata olivacea aromatica, stigmat. 4–5.—In insulis Tigu (Barclay, n. 2722, Herb. Brit. Mus.) et Honduras (Barclay, n. 2633, l. c.) et Tamper (Berlandico, Herb. Cand.).—Frutex 3-pedalis, ramuli glabri, nodi tumidi, foliorum limbi 0,085 longi 0,05 lati, petioli 0,02 longi.

c. Stigmata 4.

P. hirtellum; foliis brevissime petiolatis oblongis oblongo-lanceola-

tisve apice acuminatis acutis basi rotundatis supra glabris subtus ad nervum centralem subtilissime puberulis siccis membranaceis, centrali nervo ad apicem ducto ad apicem utrinque nervos 8–10 patulo-subadscendentes vel apicem versus venas fortiores mittente, pedunculo petiolum æquanti, amento quam folium triplo breviori sublaxifloro, rachi dense molliter hirtella, bractea breviter pedicellata apice saccato-galeata acuta dorso subtiliter hirtella.—In Brasilia (Sellon, Herb. Reg. Ber. n. 228).—Frutex, ramuli glabri, nodi tumidi, foliorum limbi 0,12 longi 0,035 lati, petioli 0,003 longi.

P. Francovilleanum; foliis brevissime petiolatis subovato-ellipticis apice protracto-acuminatis acutis basi inæqualiter rotundatis latere maj. auriculatim producto supra glabris subtus ad nervum centrale villosis margine ciliatis siccis rigidulo-membranaceis, centrali nervo ad apicem ducto ad apicem nervos utrinque 20 alternos venasque fortiores patulo-adscendentes mittente, pedunculo petiolum multot. superanti, amento quam folium triplo breviori densifloro, rachi villosa foveolata, bractea prope florem inserta lanceolata.—In Brasilia prope Barra (Spruce, n. 1784, Herb. Francov.) et San Gabriel da Cocheira ad Rio Negro (Spruce, n. 2362, Herb. Cand.).—Fruticulus simplex apicem versus dense villosus, nodi tumidi, foliorum limbi 0,2 longi 0,085 lati, petioli 0,005 longi.

WOLFFIA ARRHIZA, Wimmer, IN ENGLAND.

BY HENRY TRIMEN, M.B. LOND., F.L.S.

The rivers and ponds of Great Britain will probably well repay an active search by yielding several species of water plants not yet noticed as inhabitants of this country. The Lemnaceous plant forming the subject of this article has been hitherto overlooked in England, though now that attention is drawn to its existence here, it is likely to be found in many places within our boundary.

The locality where I detected this—I suppose our smallest phanerogamous plant—is a pond near Staines, Middlesex. It grows in abundance there, floating on the surface of the water between the fronds of *Lemna polyrrhiza, L. gibba,* and *L. minor.*

The genus *Wolffia* (named after Johann Friedrich Wolff, author of a

'Commentatio de Lemnâ,' Altdorff, 1801) was founded by Horkel on an Egyptian plant to which I shall presently allude, and was first accurately defined by Schleiden in 1839 (Linnæa, vol. xiii. p. 389). In this paper only one species, *W. Delilii*, is given, but in a reprint of the paper in 1844 (Beiträge zur Botanik, vol. i. p. 233), the author added the *Lemna arrhiza* of Linnæus to the genus, under the name of *W. Michelii.* In 1849, Weddell (Ann. des Sc. Nat., 3rd series, vol. xii. p. 170) described another species, *W. Brasiliensis.*

From these papers, and an elaborate memoir on *Lemna arrhiza* (L.), by Hoffmann, published in 1840, in Weigmann's Archiv., and translated in the Ann. des Sc. Nat., 2nd ser., vol. xiv. p. 223, the following definition of the genus has been derived:—

WOLFFIA, Horkel and Schleiden.—*Horkelia*, Rchb.—Flowers monœcious, altogether naked. *Male flower:*—Stamen 1. Filament very short and thick; anther subglobose, unilocular. *Female flower:*—Ovary one, 1-celled, 1-seeded. Ovule atropous, nearly erect Style very short. Fruit a spherical, 1-seeded, indehiscent utricle. Seed globose, erect, with a double integument, the outer fleshy, the inner thinner, indurated above, and forming an operculum pervious at the apex. Embryo thick, turbinate, in the axis of the seed, radicle superior.—Flowers arising from a pit in the centre of the upper surface of the frond. Plants increasing chiefly by gemmation, the bud (new frond) single, growing from within the base of the extremity of the parent frond and shortly stalked. Rootless. No spiral vessels.

The plants composing this genus seem to require separation from *Lemna* on account of their different mode of gemmation, the absence of roots, the central position of the flowers, and the single stamen. The cells composing the epidermis are also of a different shape, being bounded by straight instead of flexuose sides, as in *Lemna*, the stomata also are larger and the cellular structure of the frond more lax than in the species of the latter genus.

The synonymy of the British species is as follows:—

Lenticularia omnium minima, arrhiza, Micheli, Nov. Plant. Genera, p. 16 (1729).

Lemna arrhiza, Linn. Mant. ii. 294 (1767).

Wolffia Michelii, Schleiden, Beitr. z. Botan. i. p. 233 (1844).

"*Telmatophace arrhiza,*" Welwitsch, Herb. Lusitan. (sp. coll. 1848).

"*Wolffia globosa?* anne *Lemna arrhiza* (L.) *florifera?*," Welw. Herb. Angolense (sp. coll. 1851).

Wolffia arrhiza, Wimmer, Fl. v. Schlesien, 3rd ed. (1857), teste Hegelmaier in Seem. Journ. Bot. vol. iii. p. 110.

Bruniera vivipara, Franchet in Billotia, vol. i. p. 25 (1864).

I have adopted Wimmer's name, as it preserves Linnæus's excellent specific appellation which should have been retained by Schleiden.

Whether the plant known as *Wolffia Delilii* (Schleid.) be the same as *W. arrhiza* is doubtful. What Schleiden intended by this, the type of the genus, is rendered difficult to determine in consequence of his referring as a synonym to *Lemna hyalina*, Delile. Now, that botanist defines his plant thus, "Radice ligulata pellucida" (Fl. Ægypt. Illustratio, p. 75, 1812). This does not at all fall in with Schleiden's definition of *W. Delilii*, which agrees sufficiently well with the British plant, which is rootless. We can only suppose, therefore, that the reference to Delile is erroneous, and that the plants on which Schleiden founded the genus and drew up his specific characters were either *W. arrhiza* or some closely allied species collected in Egypt.

A plant collected in Congo by Dr. Welwitsch and labelled "*Wolffia Delilii*," is probably a distinct species, as indeed is suggested by the collector in a note attached to the specimen, where the name *W. Conguensis* is proposed. It is totally unlike *W. arrhiza*.

In the last number of the Linnean Society's Journal (vol. ix. p. 265), an Indian "*Wolffia Delilii* (Schleid.)" is described by Mr. Kurz, of Calcutta. From this description and the figures (tab. v. figs. 7–12) the plant seems to differ in no respect from the British *W. arrhiza*. I have, however, seen no specimens from India.

If this Indian plant be the same as ours, the following synonyms may be added to those already given:—

Lemna globosa, Roxb. Fl. Ind. vol. iii. p. 565 (1832).

Wolffia Delilii, Schleid. in Linnæa, vol. xiii. p. 389 (1839), excl. reference to Delile.

Grantia globosa, Griffith, Not. Monocot., p. 229, tab. 267, fig. ii. (1851).

Wolffia Schleideni, Miquel, Fl. Ind. Bat. iii. 221 (1855).

If this turn out to be a distinct species from *W. arrhiza*, the name of *Delilii* should be discarded and Roxburgh's prior one of *globosa* adopted in its stead.

W. Brasiliensis (Weddell) is thought by Dr. Welwitsch to be a form of *arrhiza;* this may be so, but authentic specimens look very distinct from our plant, the raised nodules on the epidermis being quite evident in the dried plant.

The characters of the British species may be thus given:—

Frond $\frac{1}{4}$–$\frac{1}{2}$ line long, $\frac{1}{6}$–$\frac{1}{4}$ line broad. Upper surface more or less convex or nearly flat, elliptic or subrotund in outline, bright-green; under surface globose, spongy, pale green; on a side view the frond almost as deep as long, semitransparent. Gemmiparous. The bud single, arising within the parent frond and ultimately bursting through the epidermis at the base of the extremity of its long axis, then invaginated by a circular projecting entire rim, which, when the young frond is separated from its parent, forms a cup-shaped fossa. Perfectly rootless. Flowers not yet seen in Britain.

GEOGRAPHICAL DISTRIBUTION.—*Europe:* Portugal, abundant, *Welwitsch!;* France, *Duchesne, etc.;* Corsica, *Bertoloni;* Italy, *Micheli;* Switzerland, *Suter;* Belgium, *Le Jeune;* Holland, *Hoffmann;* Germany, *Bulnheim!;* England. *Asia:* ("*W. Delilii,* Schleid.") Bengal, *Roxburgh, etc.;* Eastern Java, *Miquel. Africa:* Angola, *Welwitsch!,* abundant and profusely flowering; Egypt?, *Schleid. America:* New Orleans!, specimens in Kew Herbarium, dried amongst *Lemna minor,* and not named.

Though this minute plant has so extended a range, it probably requires a considerably high temperature, and is nowhere in Europe very abundant except in Portugal and the South of France. I believe the other European stations are mostly isolated ones. It is remarkable that the plant has never been seen in flower in Europe.

It is quite unnecessary to enter here into any account of the physiology, anatomy, economy, and mode of reproduction of this interesting species. An excellent account of all this will be found in Hoffmann's paper already referred to. Weddell (loc. cit.) has given a full description of the flowers and fruit of *W. Brasiliensis,* and an account by Hegelmaier of flowering specimens of *W. arrhiza,* collected for the first time by Dr. Welwitsch, in Angola, will be found in this Journal (vol. iii. p. 110).

Several figures of our plant can be quoted, the original one of Micheli (loc. cit. tab. 11, fig. 4) is very fair, and Hoffmann's nearly all that can be desired. Franchet (loc. cit.) has figured the mode of

reproduction in a diagrammatic way, and Hegelmaier gives drawings of the flowers (loc. cit. tab. 29). There is also a highly-coloured representation in Reichenbach's Icones Fl. Germ. vol. vii. tab. 14.

In no figure that I have seen is the oblique way in which the new frond springs from its parent well shown, nor does any express clearly the peculiar sort of convexity of the upper surface of the frond. The convexity is from side to side, the upper surface seeming, as it were, to overlap the sides of the frond, so that it is only by the want of stomata and the lighter colour that it can be seen where the upper surface ceases. From end to end in the long diameter the frond is nearly flat, and there is a well-defined edge at either extremity.[1]

It is scarcely necessary to allude to the idea once prevalent amongst botanists that *W. arrhiza* is merely a young or abortive state of some *Lemna*, nor to the recent proposal of M. Franchet, to include the plant among the seaweeds.

I will conclude this notice with a list of the species of *Wolffia* at present known:—

1. *W. arrhiza*, Wimmer, including *W. Delilii*, Schleid., and *W. Schleideni*, Miquel.
2. *W. Brasiliensis*, Weddell, loc. cit..
3. *W. microscopica*, Kurz. (*Grantia*, Griff. Not. Monocot. p. 226.)
4. *W. Conguensis*, Welwitsch, ms.
5. *W. repanda*, Hegelmaier, loc. cit.
6. *W. Welwitschii*, Hegelmaier, loc. cit.

HIERACIUM PRÆCOX, NOVA FLORÆ BRITANNICÆ PLANTA.

Auctore C. H. Schultz-Bipontino.

Hieracium præcox, C. H. Schultz-Bip. in Pollichia x. anno 1851.—*Hieracii murorum*, Linn., nomine in Musei Britannici herbario die xxvi m. Maji *Hieracii præcocis* specimina examinavi in Britannia (1) Great Orme's Head et (2) Castell Dinas Bran, Denbigh, N. Wales, a cl. J. E. Bowman lecta.

Planta Britannica a nostra in Palatinatu ad Rhenum, in sylvaticis supra vineas prope Deidesheim crescente, non differt, et primâ dignoscitur a

Hieracio murorum, Linn., foliis glaucis, supra glaberrimis, pl. maculatis, margine longe ciliatis, capitulis paucis, floribus dilutius aureis, involucro non tam glandulifero. Apud nos in Palatinatu *H. præcox* quatuordecim dies prius quam *H. murorum* floret, imo sæpius jam mense Aprili.

ON THE PHYLLOID SHOOTS OF *SCIADOPITYS VERTICILLATA*, *Sieb. & Zucc.*

By Alex. Dickson, M.D.

Botanists have long been familiar with plants where a very much reduced condition of the leaves is correlated with a leaf-like development of certain shoots, which, physiologically, may be said to play the part of leaves. These phylloid shoots, like the organs which they simulate, are very variable in form, some being flattened, as in *Xylophylla*, *Phyllocladus*, and *Ruscus;* others more or less cylindrical or needle-like, as in the abortive peduncles which perform leaf functions in *Asparagus*. These structures may be provided with rudimentary leaves springing from the margin, or some part of the surface, as in *Ruscus* and *Xylophylla*, from the axils of which flowers are frequently produced; while in others, such as *Danaida (Ruscus) racemosa* and *Asparagus*, these leaf-like shoots neither give origin to leaves nor flowers. Such shoots (with exception of some in *Phyllocladus*) are invariably arrested in their longitudinal development by the atrophy of the *punctum vegetationis*. They are readily recognised by their position as axillary to true leaves.

In *Sciadopitys* I have to call attention to the fact that the leaves of the growing shoots (except in young plants) consist, as in *Pinus*, entirely of bud-scales. In each year's growth the lower scales are placed at some distance from each other, and, for the most part, do not produce axillary branches. The scales towards the extremity of the year's growth, on the other hand, are closely approximated to each other, and in their axils are produced those bodies which have hitherto been termed the leaves of this plant. These are green linear organs, bearing a considerable resemblance to the leaves of some other Conifers, and occur singly in the axils of the scales. They are slightly bifid at their extremity, and exhibit a pretty deep mesial furrow on

both upper and under surface. On dissection they present two vascular bundles, one on either side of the middle line, in which respect they differ essentially from those scales which, in young specimens of this plant, are occasionally developed as elongated green leaves, and which invariably exhibit a mesial vascular bundle or midrib. The axillary bodies performing leaf functions in *Sciadopitys*, therefore, are distinguished from true leaves, not only by their position but by their structure, and I think that most botanists will agree with me in referring them to the category of phylloid shoots analogous to those in *Phyllocladus*, etc.

PHYLLACTIDIUM, A GENUS OF FRESHWATER ALGÆ NEW TO THE ENGLISH FLORA.

BY DR. JOHN EDWARD GRAY, F.R.S., ETC.

Mr. Aylward, of Strangeway, Manchester, has kindly sent me a minute plant, which he discovered while searching for water insects in a small round shallow pond, near the back of the New Assize Court, at Manchester. He observes, "The plant gradually developed itself in the water when placed in a bottle. The plant adheres to the side of the bottle, and forms a flattish cone, and round the edge of its base throws out delicate white rootlets, which swim freely in the water, and might be mistaken for confervoid growth."

The plant is evidently *Phyllactidium pulchellum* of Kützing's Phyc. Gener. 297. t. 16. f. 11. The form is discoidal, circular, slightly concave on one side, formed of very many very minute, nearly equal-sized, square cells, placed on forked lines regularly spreading from a central cell to the circumference; the frond is thin, membranaceous, and the upper and under surfaces are similar. The fructification consists of 12 to 16 square thickened patches, forming a circle (sometimes two) rather nearer the margin than the centre of the disk, the square patches being often placed in pairs. The fructification was first observed, and is well figured by Suringar, in his thesis entitled 'Observationes Physiologicæ,' delivered in Leyden on the 3rd of March, 1857, page 26. f. 4 *a*.

Kützing places *Phyllactidium* next to *Coleochæte*, with *Conferva*. See 'Species Algarum,' p. 424. Rabenhorst, in his Cryptogamic Flora

of Germany, p. 134, unites the genera *Phyllactidium* and *Coleochæte* together under the former name, regarding *Coleochæte* as a species of *Phyllactidium* under the name of *P. Coleochæte*. I suspect, from Hassall's description of his specimens of *Coleochæte*, that he must have confounded this Alga and some of the *Coleochæte* of Brebisson together.

The two genera are most distinct, and I believe that *Phyllactidium* must be separated from *Coleochæte*, which is allied to *Bulbochæte*, and formed into a family by itself, characterized by the simplicity and uniformity of the cells, and the very peculiar fructification.

I have compared the specimens from Manchester with authentic specimens of *Phyllactidium* and *Bulbochæte* from Germany, which are in the British Museum collections. The Manchester specimens are larger and better developed, but not otherwise different.

Phyllactidium is known from the discoidal form of *Bulbochæte* by the frond being membranaceous, and of equal thickness in all its parts, and the cells similar on both sides of the surface. In *Bulbochæte*, on the contrary, the upper surface of the frond is covered with trumpet-shaped tubes, emitting a *long seta*, which are more abundant near the centre of the frond, the frond much thickened by them, and the fructification, which is well described by M. Brebisson (Ann. Sc. Nat. sér. 3; Bot. Journ. i. 29. t. 2), is very different, as I have proved by a microscopic examination of the fructification of the two genera.

The fronds of *Phyllactidium* are regularly circular, and composed of very regularly-dispersed, forked, radiating lines of cells, until they arrive at a determinate size; then some of the cells on the margin diverge, and seem to form a centre for themselves, and the edge becomes proliferous; but this is a fact that does not seem to have been observed by the German algologist; and as the manner in which the cells develope is very various and peculiar, I must leave this part of the subject to another paper devoted to that object, which will be illustrated with figures, which Miss Staveley has most kindly prepared for me.

PHÆNOGAMS AND FERNS COLLECTED IN OTAGO, NEW ZEALAND.

By W. Lauder Lindsay, M.D., F.R.S. Edin., F.L.S.

The following is a systematic enumeration of the *Flowering-plants*

and Ferns collected by me in 1861 (October to December) on the eastern seaboard of Otago, in the settled districts between Dunedin, its capital, and the Clutha River. It may be desirable to explain that the collection was made in the *spring* of the Otago calendar,—at a time, therefore, when a considerable portion at least of its characteristic herbaceous plants was neither in fruit nor flower. Hence a proportion of the plants collected was unsuitable for identification; and hence also the collection was neither so large nor so interesting as it otherwise might and would have been. The species were determined by Dr. Hooker while preparing his Handbook of the N. Z. Flora (1864, part 1), in which work all the plants now enumerated are described, the new species for the first time.

* The asterisk prefixed indicates plants which are also *British*.
† Indicates *new species*.

RANUNCULACEÆ.
Clematis indivisa, *Willd.*
C. Colensoi, *Hook. fil.*
var. rutæfolia, Fl. N. Z.
Ranunculus lappaceus, *Sm.*
var. multiscapus, *Hook. fil.*
[R. multiscapus, *Fl. N. Z.*]
R. macropus, *Hook. fil.*
R. acaulis, *Banks and Sol.*

MAGNOLIACEÆ.
Drimys axillaris, *Forst.*

CRUCIFERÆ.
*Nasturtium palustre, *De Cand.* [N. terrestre, *Fl. N. Z.*]
*Cardamine hirsuta, *Linn.*
Lepidium oleraceum, *Forst.*

VIOLARIEÆ.
Viola filicaulis, *Hook. fil.*
V. Cunninghamii, *Hook. fil.*
Melicytus ramiflorus, *Forst.*

PITTOSPOREÆ.
Pittosporum tenuifolium, *Banks and Sol.*

PORTULACEÆ.
Claytonia Australasica, *Hook. fil.*
*Montia fontana, *L.*

HYPERICINEÆ.
Hypericum gramineum, *Forst.*
H. Japonicum, *Thunb.*

MALVACEÆ.
Plagianthus betulinus, *A. Cunn.*

TILIACEÆ.
Aristotelia racemosa, *Hook. fil.*
A. fruticosa, *Hook. fil.*
Elæocarpus Hookerianus, *Raoul.*

LINEÆ.
Linum monogynum, *Forst.*

GERANIACEÆ.
*Geranium dissectum, *L.*
var. Carolinianum, *Fl. N. Z.*
subvar. pilosum, *Forst.*
G. microphyllum, *Hook. fil.* [G. potentilloides, *Fl. N. Z.*]
Pelargonium australe, *Willd.*
var. clandestinum, *L'Hér.*
[P. clandestinum, *Fl. N. Z.*]
Oxalis Magellanica, *Forst.*

RUTACEÆ.
Melicope simplex, *A. Cunn.*

OLACINEÆ.
Pennantia corymbosa, *Forst.*

RHAMNEÆ.

Discaria Toumatou, *Raoul.*
[D. australis, *var.* apetala, *Fl. N. Z.*]

CORIARIEÆ.

Coriaria ruscifolia, *Linn.*
C. thymifolia, *Humb.*

LEGUMINOSÆ.

Carmichaelia flagelliformis, *Col.*
Sophora [Edwardsia] tetraptera, *Ait.*
var. β. microphylla, *Jacq.*

ROSACEÆ.

Rubus australis, *Forst.*
var. glaber, Fl. N. Z., and *var.* cissoides, *A. Cunn.*
*Potentilla anserina, *Linn.*
*Geum urbanum, *Linn.*
**var.* strictum.
[G. Magellanicum, *Fl. N. Z.*]
Acæna Sanguisorbæ, *Vahl.*

CRASSULACEÆ.

Tillæa verticillaris, *De Cand.*

DROSERACEÆ.

Drosera binata, *Labill.*

HALORAGEÆ.

Haloragis alata, *Jacq.*
Myriophyllum elatinoides, *Gaud.*
Gunnera monoica, *Raoul.*

MYRTACEÆ.

Leptospermum scoparium, *Forst.*
L. ericoides, *A. Rich.*
Metrosideros lucida, *Menzies.*
M. hypericifolia, *A. Cunn.*
Myrtus obcordata, *Hook. fil.*

ONAGRARIEÆ.

Fuchsia excorticata, *Linn. fil.*
Epilobium macropus, *Hook.*
E. alsinoides, *A. Cunn.*
E. rotundifolium, *Forst.*
E. junceum, *Forst.*
E. pubens, *A. Rich.*

FICOIDEÆ.

Mesembryanthemum australe, *Solander.*
Tetragonia expansa, *Murray.*

UMBELLIFERÆ.

Hydrocotyle elongata, *A. Cunn.*
Aciphylla squarrosa, *Forst.*
†A. Colensoi, *Hook. fil.*
Ligusticum [Anisotome, *Fl. N. Z.*] intermedium, *Hook. fil.*
L. aromaticum, *Banks and Sol.*
Angelica [Anisotome, *Fl. N. Z.*] Gingidium, *Hook. fil.*
A. geniculata, *Hook. fil.*
Daucus brachiatus, *Sieber.*

ARALIACEÆ.

Panax crassifolium, *Dcne. and Planch.*
P. Colensoi, *Hook. fil.*
Schefflera digitata, *Forst.*
[Aralia Schefflera, *Fl. N. Z.*]

CORNEÆ.

Griselinia lucida, *Forst.*

LORANTHACEÆ.

Loranthus Colensoi, *Hook. fil.*
L. micranthus, *Hook. fil.*
Tupeia antarctica, *Cham. and Schlecht.*
†Viscum Lindsayi, *Oliver.*

RUBIACEÆ.

Coprosma lucida, *Forst.*
C. rotundifolia, *A. Cunn.*
C. parviflora, *Hook. fil.*
[C. myrtillifolia, *Fl. Antarct.*]
C. propinqua, *A. Cunn.*
C. acerosa, *A. Cunn.*
C. linariifolia, *Hook. fil.*
[C. propinqua, *var. γ. Fl. N. Z.*]
Galium umbrosum, *Forst.*
[G. propinquum, *Fl. N. Z.*]
Asperula perpusilla, *Hook. fil.*

COMPOSITÆ.

Olearia nitida, *Hook. fil.*
O. ilicifolia, *Hook. fil.*

[Eurybia dentata, β., *Fl. N. Z.*]
O. avicenniæfolia, *Hook. fil.*
O. virgata, *Hook. fil.* and *var.* γ.
†Celmisia *Lindsayi*, *Hook. fil.*
C. longifolia, *Cass.*
[C. gracilenta, *Fl. N. Z.*]
Vittadinia [Eurybiopsis, *Fl. N. Z.*] australis, *A. Rich.*
Lagenophora Forsteri, *De Cand.*
L. pinnatifida, *Hook. fil.*
Cotula coronopifolia, *Linn.*
C. dioica, *Hook. fil.* [Leptinella, *Fl. N. Z.*]
Craspedia fimbriata, *De Cand.*
Cassinia leptophylla, *Br.*
C. Vauvilliersii, *Hook. fil.*
C. fulvida, *Hook. fil.*
[C. leptophylla, *var.* γ., *Fl. N. Z.*]
Gnaphalium bellidioides, *Hook. fil.*
G. trinerve, *Forst.*
*G. luteo-album, *Linn.*
G. involucratum, *Forst.*
G. collinum, *Labill.*
Erechtites arguta, *De Cand.*
E. quadridentata, *De Cand.*
Senecio bellidioides, *Hook. fil.*
S. lautus, *Forst.*
Microseris Forsteri, *Hook. fil.*
†Crepis Novæ-Zelandiæ, *Hook. fil.*
*Taraxacum Dens-Leonis, *Desf.*
*Sonchus oleraceus, *Linn.*

CAMPANULACEÆ.

Wahlenbergia gracilis, *A. Rich.*
W. saxicola, *A. De Cand.*

ERICEÆ.

Gaultheria antipoda, *Forst.*
G. rupestris, *Br.*
var. δ. [Colensoi, *Fl. N. Z.*]
Leucopogon Fraseri, *A. Cunn.*
Dracophyllum longifolium, *Br.*

MYRSINEÆ.

Myrsine Urvillei, *A. De Cand.*
[Suttonia australis, *Fl. N. Z.*]

PRIMULACEÆ.

Samolus littoralis, *Br.*

APOCYNEÆ.

Parsonsia albiflora, *Raoul.*
[P. heterophylla, *Fl. N. Z.*]
P. rosea, *Raoul.*

BORAGINEÆ.

Myosotis australis, *Br.*
M. antarctica, *Hook. fil.*
M. capitata, *Hook. fil.*

CONVOLVULACEÆ.

Convolvulus Tuguriorum, *Forst.*
*C. Soldanella, *Linn.*

SOLANEÆ.

Solanum aviculare, *Forst.*

SCROPHULARINEÆ.

Mimulus radicans, *Hook. fil.*
Veronica salicifolia, *Forst.*
V. elliptica, *Forst.*

VERBENACEÆ.

Myoporum lætum, *Forst.*

CHENOPODIACEÆ.

Salicornia Indica, *Willd.*

POLYGONEÆ.

*Polygonum aviculare, *Linn.*, *var.* β. Dryandri, *Spr.*
Muhlenbeckia adpressa, *Lab.*
[Polygonum australe, *Fl. N. Z.*]
Rumex flexuosus, *Forst.*

THYMELEÆ.

Pimelea prostrata, *Vahl.*

EUPHORBIACEÆ.

Euphorbia glauca, *Forst.*

CUPULIFERÆ.

Fagus Menziesii, *Hook. fil.*

URTICEÆ.

Epicarpurus microphyllus, *Raoul.*
[Trophis opaca, *Fl. N. Z.*]
Urtica ferox, *Forst.*
Parietaria debilis, *Forst.*

CONIFERÆ.

Libocedrus Bidwillii, *Hook. fil.*
Podocarpus Totara, *A. Cunn.*
P. dacrydioides, *A. Rich.*
Dacrydium cupressinum, *Soland.*

ORCHIDEÆ.

Corysanthes [Nematoceras, *Fl. N. Z.*] macrantha, *Hook. fil.*
Microtis porrifolia, *Sprengel.*
Pterostylis Banksii, *Brown.*
Thelymitra longifolia, *Forst.*
[T. Fosteri, *Fl. N. Z.*]
Prasophyllum Colensoi, *Hook. fil.*

IRIDEÆ.

Libertia ixioides, *Sprengel.*

TYPHACEÆ.

*Typha angustifolia, *Linn.*

NAIADEÆ.

*Potamogeton natans, *Linn.*
*P. heterophyllus, *Schreber.*
*Ruppa maritima, *Linn.*

LILIACEÆ.

Cordyline australis, *Hook. fil.*
Astelia nervosa, *Banks and Sol.*
Arthropodium candidum, *Raoul.*
Anthericum [Chrysobactron, *Fl. N. Z.*] Hookeri, *Colenso.*
Phormium tenax, *Forst.*

JUNCEÆ.

Juncus australis, *Hook. fil.*
J. planifolius, *Br.*
*J. bufonius, *Linn.*
*Luzula campestris, *De Cand.*, and β. picta, *A. Rich.*
[L. picta, *Fl. N. Z.*]
L. Oldfieldii, *Hook. fil.*

RESTIACEÆ.

Leptocarpus simplex, *A. Rich.*

CYPERACEÆ.

Eleocharis gracilis, *Br.*
Isolepis nodosa, *Br.*
I. riparia, *Br.* [I. setacea, *Fl. N. Z. pr. p.*]
Demoschœnus spiralis, *Hook. fil.*
Lepidosperma tetragona, *Labill.*
[L. australis, *Fl. N. Z.*]
Uncinia australis, *Pers.*
U. Banksii, *Boott.*
Carex virgata, *Solander*, and β. secta, *Boott.*
C. Gaudichaudiana, *Kunth.*
C. ternaria, *Forst.*
C. testacea, *Solander.*
C. lucida, *Boott.*
C. trifida, *Cavanilles.*
C. Forsteri, *Wahlenb.*

GRAMINEÆ.

*Alopecurus geniculatus, *Linn.*
Hierochloe redolens, *Br.*
Echinopogon ovatus, *Palisot.*
Dichelachne crinita, *Hook. fil.*
Agrostis æmula, *Br.* [Deyeuxia Forsteri, *Fl. N. Z.*]
A. quadriseta, *Br.*
Arundo conspicua, *Forst.*
Danthonia Cunninghamii, *Hook. fil.*
[D. antarctica, *var.* β. laxifolia, *Fl. N. Z.*]
D. semi-annularis, *Br.*, and *var.* β. pilosa, *Br.* [D. pilosa, *Fl. N. Z.*]
*Deschampsia cæspitosa, *Palisot.*
*Kœleria cristata, *Persoon.*
Trisetum antarcticum, *Trinius.*
Poa imbecilla, *Forst.*
P. breviglumis, *Hook. fil.*
P. anceps, *Forst.*
P. australis, *Br.*, *var.* lævis, *Br.*
[P. lævis, *Fl. N. Z.*]
†P. Lindsayi, *Hook. fil.*
Festuca littoralis, *Br.*
[Schedonorus, *Fl. N. Z.*]
*F. duriuscula, *Linn.*
Triticum scabrum, *Br.*

FILICES.

Cyathea dealbata, *Swartz.*
C. medullaris, *Swartz.*
Hymenophyllum multifidum, *Swartz.*
H. crispatum, *Wallich.*
Adiantum affine, *Willdenow.*
Hypolepis tenuifolia, *Bernhardi.*
H. Millefolium, *Hook.*
Pellæa [Pteris, *Fl. N. Z.*] rotundifolia, *Forst.*
*Pteris aquilina, *Linn.*
var. esculenta, *Forst.*
P. incisa, *Thunberg.*
[P. vespertilionis, *Fl. N. Z.*]
Lomaria procera, *Sprengel.*
L. fluviatilis, *Sprengel.*
L. pumila, *Raoul.*
L. lanceolata, *Sprengel.*
L. discolor, *Willdenow.*
L. alpina, *Sprengel.*
L. Banksii, *Hook. fil.*
Asplenium obtusatum, *Forst.*
A. lucidum, *Forst.*, and *var.* β. Lyallii, *Fl. N. Z.*
A. flabellifolium, *Cavanilles.*
A. falcatum, *Lamarck.*
[A. polyodon, *Fl. N. Z.*]
A. bulbiferum, *Forst.*, and *vars.* β. laxa, *Br.*, and γ. tripinnata.
A. flaccidum, *Forst.*
*Aspidium aculeatum, *Swartz.*
var. vestitum, *Hook.*
[Polystichum vestitum, *Fl. N. Z.*]
A. Richardi, *Hook.*
[Polystichum aristatum, *Fl. N. Z.*]
Nephrodium hispidum, *Hook.*
[Polystichum, *Fl. N. Z.*]
Polypodium australe, *Mettenius.*
[Grammitis, *Fl. N. Z.*]
P. Grammitidis, *Br.*
P. pennigerum, *Forst.*
[Goniopteris, *Fl. N. Z.*]
P. rupestre, *Br.*
[Niphobolus, *Fl. N.* Z.]
P. Billardieri, *Br.*
[Phymatodes, *Fl. N. Z.*]
Leptopteris hymenophylloides, *Presl.*
*Ophioglossum vulgatum, *Linn.*
var. β. costatum, *Br.*
Botrychium cicutarium, *Swartz.*
var. α. [B. virginicum, *Fl. N. Z.*]

LYCOPODIACEÆ.

Lycopodium Billardieri, *Spreng.*
*L. clavatum, *Linn.*
var. Magellanicum, *Swartz.*
L. volubile, *Forst.*

MARSILEACEÆ.

Azolla rubra, *R. Br.*

GRIMMIA SUBSQUARROSA, A NEW BRITISH MOSS.

GRIMMIA SUBSQUARROSA, *Wils.*, a new species found in Perthshire, by Dr. F. B. White. Dioicous. Stems loosely tufted, dichotomous. Leaves spreading and recurved, lanceolate, acute, hair-tipped, keeled, margin thickened and reflexed, areolate quadrate, enlarged at the base.—*Hab.* Hill of Moncrieff and Hill of Kinnoul, near Perth, May, 1865 (barren).—Very nearly allied to *G. alpestris*, Schl., but differs in the

form, direction, and texture of the leaves, which are composed of a single layer of cellules, except at the thickened margin.

Another species of *Grimmia*, new to Britain, viz. *G. commutata*, Hüb., has been found on the Hill of Moncrieff (barren), by Dr. J. Stirton, of Glasgow, July, 1864, and since on Stenton Rock (with fruit), by Dr. F. B. White, December, 1865. It is allied to *G. ovata*, Web. and Mohr, but differs in the channelled leaves, not reflexed in the margin, and in the dioicous inflorescence.—*W. Wilson in 'The Naturalist*,' vol. ii. p. 344.

DETERMINATION OF THREE LINNÆAN SPECIES OF CASSINIACEÆ FROM THE LINNÆAN HERBARIUM.*

BY C. H. SCHULTZ-BIPONTINUS.

During a sojourn in London from the 21st of May to the 4th of June last, which was as enjoyable as it was instructive to me, I examined all the *Cassiniaceæ* in the herbarium of Linnæus now in the possession of the Linnean Society.

The plants have only the generic and specific names attached to them, and as there are no indications of the locality, there are frequent doubts as to their native country. I observed one exception in the case of the specimens which Linnæus obtained from Patrick Browne, from Jamaica, which are all marked P. B.

Great confusion has in this way arisen in connection with the plants sent from North America, by Kalm, a pupil of Linnæus's, who was in that country from 1747 to 1749. Let me mention one or two instances from the tribe of plants which I specially examined.

Asa Gray, who has examined the herbarium of Linnæus, says, in Torrey and Gray's 'Flora of North America,' vol. ii. p. 446, under *Senecio Kalmii*, Nutt., "We are inclined to suspect some mistake respecting the habitat of several Linnæan species, said to have been collected in Canada by Kalm." Asa Gray's supposition is well founded. Canada was a province of France at the time of Kalm's visit. It is probable that he received from a French botanist in

* The author has kindly favoured us with an early proof of this article, from which we have made our translation.—ED.

Canada some French plants, and which, by mistake, were added to his true Canadian collections, and described as such by Linnæus. Torrey and Gray mention among their "obscure species of *Senecio*," two French plants, which are recorded as Canadian on Kalm's authority, viz.:—

Senecio Canadensis, Linn.! Sp. Pl. ed. i. p. 869. n. 18, which is nothing but *Senecio artemisiæfolius*, Pers., De Cand.! Prod. iv. p. 348, n. 39, a plant which is a native of Spain and France, and is especially abundant near Paris. It is easily recognized at the first glance. Linnæus consequently places it near to *Senecio abrotanifolius*, Linn. (Sp. Pl. ed. i. p. 869), as does also De Candolle in the 'Prodromus.'

Cineraria Canadensis, Linn. (Sp. Pl. ed. ii. p. 1244, n. 10) = *Senecio Kalmii*, Nutt. (Torr. and Gray, 'Flora of North America,' ii. p. 446), is nothing else than a form of *Senecio Cineraria*, De Cand.! (Prod. vi. p. 355. n. 74) which is so abundant a plant in the Mediterranean area. Linnæus compared his supposed Canadian plant with this European species.

Both plants must be struck from the flora of North America, but it will be better to retain for the plants the names by which they are now known; for it would be as absurd to name a plant "*Canadensis*" which never grew in Canada, as to give the designation *Compositæ* to a family in which there are more than a hundred species with a single-flowered capitulum, and which consequently could never be described as having a composite structure.

I will, at a future time, give the result of my examination of the *Cassiniaceæ*, in the Linnæan Herbarium, but at present I will add only another case of error from mistaken habitat.

Senecio Byzantinus, Linn.! (Sp. Pl. ed. i. p. 871) is *Senecio lyratus*, Linn. fil. (Suppl. p. 369), and consequently a plant from the Cape of Good Hope. I cannot imagine how this confusion came about. De Candolle (Prod. vi. p. 345) did not know what to do with the species, and referred it with a query to *S. Æthensis*, Jan.

NEW PUBLICATIONS.

La Vie et les Écrits de Sir William Hooker. Par M. Alphonse de Candolle. ('Archives des Sciences de la Bibliothèque Universelle,' January, 1866.)

This is a just tribute to the memory of the late Sir Willlam Hooker. As we have already given in our pages a short memoir of that distinguished botanist, and a list of his various works, we draw the attention of our readers to this paper, because of an interesting classification of botanists which the author gives when forming an estimate of the place which the subject of his memoir should occupy. As the author alone or in part of six or seven volumes in folio, four in quarto, and eighty-seven in octavo, he considers Sir W. Hooker as an example of his class of active botanists. We make the following extract, in which he explains his classification :—

"All botanists may be divided into two classes, each of which are characterized by particular qualities and particular defects. The one class I shall call *profound*, the other *active* botanists.

"The first, given to reflection, eminently conscientious, sometimes timid, take care above all things to be exact. If they have new ideas, they probe them; if they discover any fact, they consider and reconsider it many times before venturing to publish it. They know how to wait. Their progress is slow but sure. Not venturing to risk anything, they are silent about many things which would explain or complete their assertion, and obscurity is therefore sometimes the result. They are unwilling to generalize or to make systems, because generalizations and systems always include unknown elements, hypotheses in them being mixed up with the facts. Their works do not encumber our library shelves, but we consult their every line. Cæsalpinus, Micheli, the three Jussieus, St. Hilaire, and, above all, Robert Brown, in botany, and Theodore de Saussure in vegetable chemistry, are representatives of this class.

"On the other hand, the botanists whom I call *active* are such as these,—Bauhin, Tournefort, Ray, Linné, de Lamarck, de Candolle, Lindley, and of those who are not exclusively botanists, Humboldt. These are filled with extraordinary ardour. They wish to advance, and to make others advance as well. They say and print all that they know, and sometimes more. They try to be clear, that they may be at once understood. They generalize that they may simplify. They are, or can be, good professors; they stand high in public estimation. They astonish by the extent of their works and the variety of their researches and ideas. They prosecute several sciences with the same vigour. They are not frightened to venture on a hypothesis, or even at an error in fact; they willingly admit *errare humanum est.* If they have a good idea, at once

they successfully apply it. Had the binominal nomenclature of species been proposed in the essay of some profound botanist as desirable, it would have received no attention; but Linné published a 'Species' according to this plan, and it was adopted. Some botanists are so active that at some periods of their lives their works overflow. They hand them over to their disciples, as Linné did with his Dissertations. One of the active botanists whom I have named was the sole author of a quarto volume which is hightly esteemed in science. He gave the MS. to one of his favourite pupils for a thesis. Neither ever mentioned a word about the matter: only by chance did I discover the fact twenty-four years after the death of the real author, and one after that of him in whose name it was published. It is evident that botanists are sometimes good-natured people. De Jussieu and R. Brown also helped their friends; but, indeed, authors who have their portfolios always well filled ought to be the most generous.

"Active botanists sometimes fall into grave errors. Linné affords a striking example. He would have had difficulty in furnishing proofs of his supposition that the outer bark forms the calyx, the inner bark the corolla, the wood the stamens, and the pith the pistil; and yet he speaks of this as a fact, and not as a hypothesis. His theory of *prolepsis*, maintaining the evolution of organs prepared and hidden for five or six years in the interior of the plant, that of the origin of all plants from a single mountainous region under the equator, and his old comparisons between animals and plants, show more strength of imagination than of observation and reason. In general, the more active botanists are gifted with imagination, the more they fall into error. It was reserved for Goethe to show that one could be at once a great poet and a scrupulous observer. But Goethe has written little in natural history, and had he been a professor, having hundreds of students applauding his proposed theories, who knows but that he also would have sacrificed exactness to fame?"

Ferns, British and Foreign; their History, Organography, Classification, Nomenclature, and Culture, with directions, showing which are the best adapted for the Hothouse, Greenhouse, Open-air Fernery, or Wardian Case. By John Smith, A.L.S. London: Hardwicke. 1866.

The extensive acquaintance which Mr. Smith has with Ferns, both living and in the herbarium, and the numerous and valuable contributions which he has made to this department of botany during a long life, make a volume, in which he gives his most mature views as to classification, and his experiences as to cultivation, alike valuable to the horticulturist and to the botanist. His little 'Catalogue of Cultivated Ferns,' published some ten years ago, has grown, under his hand, into the present good-sized and complete manual, in which every genus is fully described and illustrated by a woodcut, showing the venation

and fructification peculiar to it, and a list with synonyms of the species under cultivation is given. The first chapter is devoted to a history of the introduction of exotic Ferns; and as the author has, for nearly fifty years, been engaged in their cultivation, and has carefully observed the novelties as they appeared, he gives a very interesting and, to cultivators, a very instructive narrative. He estimates the species now cultivated as somewhat over 900. His remarks on classification will repay careful study; and while we cannot accept of all the author's views, as we desiderate a more extensive basis for a permanent natural classification of this tribe of plants, yet these opinions, here clearly put, must be admitted into, and form a component part of any system that will be satisfactory.

The care bestowed to make the volume easy of consultation and complete is obvious. Indeed it will be found to be a necessary handbook to every one who tries to cultivate and desires to be intelligently acquainted with this exquisitely charming group of plants.

BOTANICAL NEWS.

Our obituary of this month contains the names of three eminent British Algologists, Professor Harvey, Dr. Greville, and Miss Cutler:—

William Henry Harvey was born near Limerick on the 5th February, 1811, and educated at Ballitore school, county Kildare. He early exhibited a great liking for natural history studies, and the summer visits of his parents to the coast introduced him, while yet a schoolboy, to those plants in the exposition of which he spent his life. On leaving school he entered his father's office, and though he acquired here the accurate business habits which adhered to him to the last, his heart was in his favourite studies. His spare hours and holidays were devoted to collecting, and in addition to a considerable herbarium of native plants both phanerogamic and cryptogamic, he formed collections of the mollusca and insects of the south-west of Ireland. At this time he added a new freshwater shell to the British fauna, and discovered two new habitats for the rare *Hookeria læte-virens*. He now resolved to devote himself more to botanical pursuits, and sought some employment that would permit this. At length he was offered the appointment of Colonial Treasurer of the Cape of Good Hope, but by an unaccountable error the appointment was made out in the name of his elder brother, and a change in the Ministry prevented its being set right. The two brothers sailed for the Cape in 1835. They had scarcely settled in the colony when the elder brother's health suddenly gave way, and compelled them to return home. On arriving in England Harvey heard that

he had been appointed as his brother's successor, and in a few months he returned to the Cape, where he remained till 1839, when his health, never at any time strong, but now impaired by the labours of his office and his devotion to his studies, compelled him to visit England for a few months. The year 1840 found him again in Africa, spending his days at his official work and his nights in botanical pursuits, and though warned by former experience his labours were more than he could endure, and again necessitated his return to his native country in 1841, when he resigned his colonial appointment. In 1844 he was elected keeper of the herbarium of the Dublin University, vacant by the death of Coulter, the Californian and Mexican traveller. He presented his herbarium of upwards of 10,000 species to the University, and at once began to arrange his own and Coulter's extensive collections. The University conferred on him the honorary degree of M.D. In 1847 Harvey was elected Professor of Botany to the Royal Dublin Society. On the joint invitation of the Smithsonian Institution and the Harvard University, in 1849, he visited the United States, and delivered several courses of lectures. He also made large collections of the *Algæ* of North America, descriptions of which were published in the 'Smithsonian Contributions.' On his return to Dublin he obtained permission from the University to make a voyage round the world, chiefly with the view of extending his acquaintance with marine plants in their native habitats. In August, 1853, he left for Ceylon, stopping at Aden to collect on the way. He then visited the east, south, and west coasts of Australia and Tasmania. Taking advantage of the visit of the 'John Wesley' missionary ship, he went to New Zealand, the Viti and the Friendly Islands. He next proceeded to Valparaiso, where his health gave way, and he hastened home by Panama, reaching England in 1856, after an absence of three years. Shortly after his arrival in Dublin he succeeded Professor Allman (removed to Edinburgh), in the chair of Botany in the Dublin University. In 1861 he married the amiable and accomplished daughter of Mr. James Phelps, of Limerick, and in the same year he had a severe attack of hæmorrhage of the lungs, the first symptom of that disease which ultimately caused his death. He still, however, diligently discharged his public duties, and pursued his scientific labours until 1865, when he was unable to lecture to his class. He spent the winter in the south of France, and with somewhat restored health he returned to his work in the herbarium for a little. Autumn and winter, 1865–66, were passed in Dublin, and in the spring of this year he visited Lady Hooker, the widow of his long-attached friend Sir W. J. Hooker, in whose house at Torquay he quietly breathed his last, on the 15th May, 1866, at the comparatively early age of fifty-five years. Hooker dedicated to him a genus of Cape *Scrophulariaceæ*, of which one species, *Harveya Capensis*, only is known. The following is a list of Dr. Harvey's principal works:—'The Genera of South African Plants,' 1838, 8vo; 'Manual of British Algæ,' 1841, 8vo; 'Phycologia Britannica,' 1846–1851, 4 vol. 8vo; 'Nereis Australis,' 1847, 8vo; 'The Seaside Book,' 1849, 8vo; 'Nereis Boreali-Americana,' 1852, 4to; 'Phycologia Australica,' 1858–63, 5 vol. 8vo; 'Thesaurus Capensis,' 1859, 2 vol. 8vo; 'Index Generum Algarum,' 1860, 8vo; and in conjunction with Dr. Sonder, 'Flora

Capensis,' 1859–65, 8vo, of which three volumes have been published. He was the author, besides, of numerous papers in Hooker's 'Journal of Botany,' and in the publications of the Royal Irish Academy, the Dublin Natural History Society, the Linnean Society, etc.

ROBERT KAYE GREVILLE was born on the 13th December, 1794, at Bishop Auckland, Durham. Unaided by books or friends, he at an early age made considerable progress in the study of botany, and before he was nineteen he had made careful coloured drawings of nearly 200 native plants. He studied medicine at London and Edinburgh, but never entered the medical profession, his means rendering him independent of practice, and his love for botany drawing his attention away to more congenial pursuits. In 1824 the University of Glasgow conferred upon him the honorary degree of LL.D. He made extensive collections of insects, shells, and crustacea, in addition to his valuable herbarium, and he delivered several courses of popular lectures on botany. His early scientific labours were chiefly devoted to cryptogamic plants, and his various works are the more valuable from the beautiful and accurate illustrations with which he accompanied them. He had a wonderful facility in the use of the pencil, and his drawings could scarcely be surpassed for their accuracy and minute detail. He also used the brush, and so successfully, that when a change of circumstances required him to work for money, he took up landscape painting as a profession, and produced many landscapes that are highly prized by lovers of art. For several years he has devoted himself to the examination and description of new forms of *Diatomaceæ*, and his papers with their exquisite illustrations are familiar to the members of the Microscopical Society of London and the Botanical Society of Edinburgh. He was a zealous and enlightened philanthropist, being especially active in the Temperance, Anti-Slavery, and Sabbath-day movements. His life has been one of great activity, and though a devoted and successful student of nature, he never engaged in any labours more heartily than in those in which he sought to benefit others. For some years his strength has been failing, but there was nothing to cause apprehension till the end of May last, when he took cold and inflammation of the lungs, which proved fatal on the morning of the 4th of June, 1866. The following is a list of Dr. Greville's principal works:—'Scottish Cryptogamic Flora,' 1823–29, 6 vol. 8vo; 'Flora Edinensis,' 1824, 8vo; 'Algæ Britannicæ,' 1830, 8vo. In conjunction with G. A. Walker-Arnott, 'A New Arrangement of the Genera of Mosses,' 1830, 8vo, and with Sir Wm. J. Hooker, 'Icones Filicum,' 1829–1831, 2 vol. folio, besides numerous papers in the Transactions of the Microscopical and of the Edinburgh Botanical Society, the 'Edinburgh Philosophical Journal,' etc.

MISS CUTLER, the well-known algologist, died on the 15th of April at Exmouth, where she had been for some years residing. She early devoted great attention to British seaweeds, and, like her friend Mrs. Griffiths, her careful observations of the growth and fructification of the species she met with helped greatly to a true appreciation of their systematic relations. To commemorate the services rendered by her to British botany, Dr. Greville selected a beautiful species of *Dictyoteæ*, very distinct from any established genus, to which he gave

the name *Cutleria*, satisfied that by her discoveries she had amply earned "the highest compliment that one botanist can bestow on another." For some time infirm health and advancing years have compelled her to give up the pursuit of her favourite studies. In 1861 she presented her fine collection of British Algæ to the herbarium of the British Museum. It contains some of the finest specimens, in the best condition, of the rarer British species that have ever been found.

We regret to find that Willkomm and Lange will be compelled to discontinue the publication of their valuable 'Prodromus Floræ Hispanicæ' unless a few more subscribers be speedily found, sufficient to cover the expense of the production of the work. It is a marvel that a work that supplies such an important desideratum in botanical libraries should not command a circulation of one hundred copies!

The University of Oxford took advantage of the visit of Professor De Candolle to the International Botanical Congress to confer on him the honorary title of D.C.L. The sister University of Cambridge had already created him an LL.D. Both honours were conferred at the same time on Dr. Joseph D. Hooker, Director of the Royal Gardens at Kew, and on some other distinguished men of science.

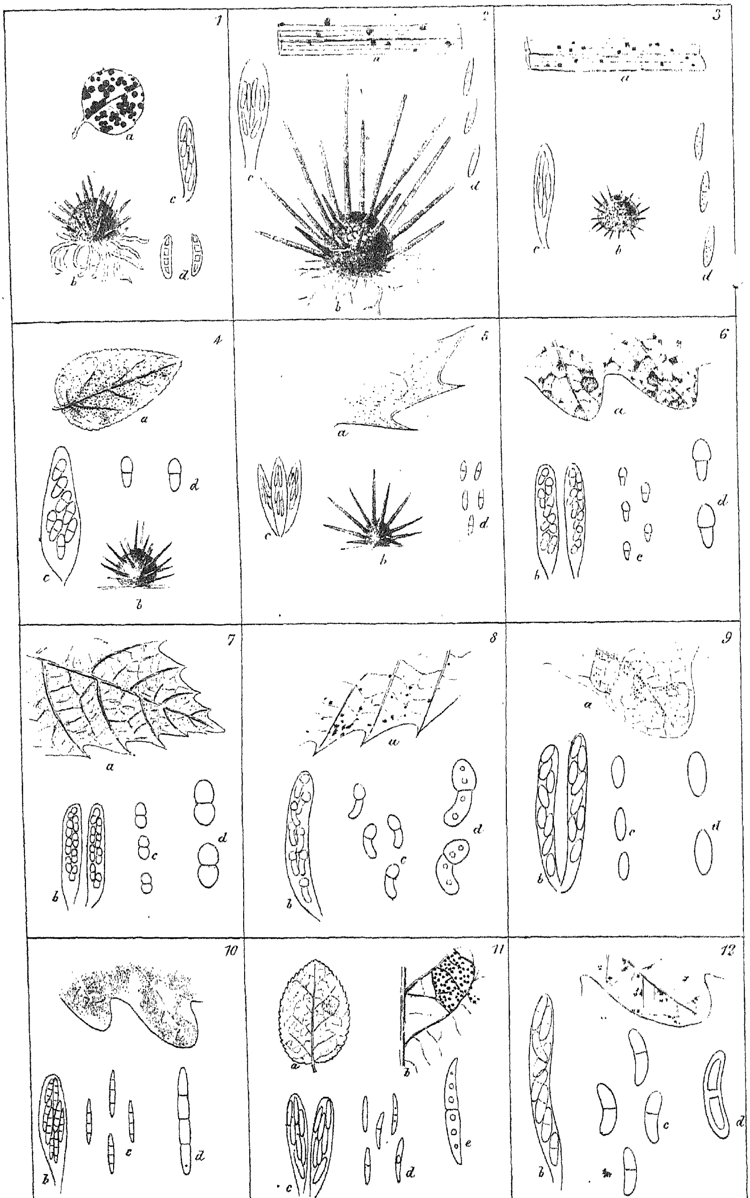
It will be gratifying to our readers to learn that in a money point of view the Great International Flower-show and Botanical Congress has been as great a success as it was in every other aspect. It is expected that a handsome and valuable volume of transactions will be published by the Congress Committee.

One of the most hardworking and successful of botanical collectors in Eastern Asia, Mr. Richard Oldham, died in Nov. 1864, at Amoy. As successor to Mr. G. Wilford, he was for some time attached to H.M. surveying vessel Swallow; he then made very extensive and excellently prepared collections on the Mantchurian coast, in the Korean archipelago, and in Japan. Prof. Oliver has published a note on some of his Japanese plants in the ninth volume of the Linnean Journal. He subsequently, at the invitation of Mr. Swinhoe, H.M. Consul in Formosa, visited that island,—an almost untrodden field to botanists,—and devoted himself assiduously to the collection of its vegetable productions. Delicate health,—he was apparently suffering from heart-disease,—and repeated attacks of fever, caused by exposure and climatic influence, compelled him to cross over, for medical aid, to the mainland of China, where, notwithstanding every care, he succumbed to dysentery. We are glad to record that, through the exertions of Mr. Swinhoe, a handsome subscription was made by the friends and acquaintances of the deceased, and that a plain but substantial granite tomb has been erected over his remains, bearing the following inscription, from the pen of Dr. H. F. Hance:—"In memoriam Ricardi Oldham, qui Manchuriæ, Coreæ, Japoniæ oris, insulæque Formosæ virgineis sylvis, botanices causa summo cum successu sedulo perlustratis, hic tandem gravi valetudine oppressus multisque fractus laboribus fato succubuit die 13 Novembris, 1864, anno ætatis suæ 26, hocce monimentum posuerunt amici. 'Tempore autem suo metemus non deficientes' (Pauli Epist. ad Galat. vi. 9)." His large collection of Formosan plants has been forwarded to England for distribution.

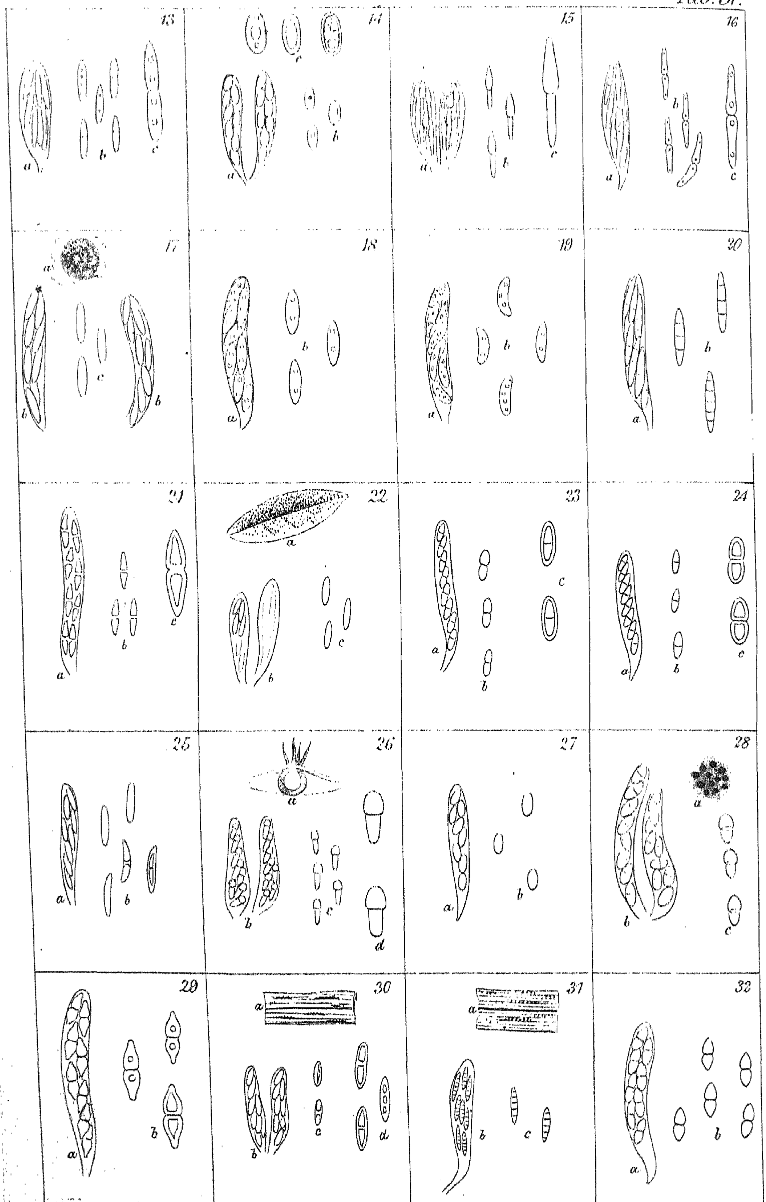
A few of the novelties have already been described by Dr. Hance in the 'Annales des Sciences Naturelles.'

BOTANICAL SOCIETY OF EDINBURGH.—*May 10th.*—Dr. R. K. Greville, President, in the chair. The following communications were read:—1. Account of a Botanical Trip to Clova with Pupils, in August, 1865. By Professor Balfour. 2. Notice of some new Diatoms from the South Pacific. By Dr. Greville. The paper was illustrated by drawings of the species described. 3. Notes on the Travancore Government Garden at Peermade. By Dr. Cleghorn. 4. On the Treatment of Hyacinths and other Bulbous Plants during Summer. By Mr. Richard Adie, Liverpool. 6. Notice of the Esparto Grass of Spain (*Macrochloa tenacissima*). By Charles Lawson, Esq., of Borthwick Hall. In this paper Mr. Lawson gave an account of the grass, as seen by him in the neighbourhood of Granada, Almeria, and Murcia, in Spain. He ascertained that upwards of 60,000 tons of the plant were exported last year from the east coast of Spain, chiefly Almeria and Carthagena, to Britain, the price being £4 per ton, free on board. Mr. Lawson suggested that it might be advisable to try the cultivation of the plant in this country, and with that view he sent fresh specimens to the Botanic Garden. 6. Notice of some Rhizomorphous Fungi. By Mr. John Sadler. 7. On the Effects produced on the Operator by the Poisoning of Plants in a Herbarium. By Captain F. M. Norman, R.N., Madeira. 8. Report on the Cinchona Plantations of Ceylon. By Clements R. Markham, Esq. Communicated by Dr. Greville. In this paper Mr. Markham reported on the thriving condition of the Cinchona plantations of Ceylon. The experiment is carried on by Mr. Thwaites, Director of the Botanic Garden at Peradenia, and the cultivation is conducted by Mr. G. M. M'Nicholl, a very intelligent gardener. 9. Report of the State of Vegetation in the Open Air at the Royal Botanic Garden. By Mr. M'Nab. Dr. Balfour exhibited specimens of an *Allium* which had been gathered by Mr. Alexander Craig Christie in the woods near Binny Crag in large quantity. It seemed to be the *Allium paradoxum* of Don. Living specimens were shown, and the characters of the species given. Dr. Balfour exhibited specimens of *Gastrolobium oxylobioides* which had been brought from near Perth, Western Australia, by Mr. Frederick Page, as being one of the plants which poison cattle and sheep in that country. It does not affect horses. Mr. Page stated that 100,000 acres of land in Western Australia cannot be used for sheep pasture on account of the presence of this plant. Mr. P. S. Robertson presented specimens of *Wellingtonia gigantea*, with male and female cones, produced at Tilliechewan Castle.

June 14th.—Dr. Alex. Dickson, V.P., in the chair. The following communications were read:—1. Obituary Notice of Dr. Greville. By Professor Balfour. In this paper Dr. Balfour gave an account of Dr. Greville's early education, of his studies at Edinburgh, and of his labours as a naturalist. 2. On the Flora of Lynn and the Vicinity. Part I. Phanerogameæ and Ferns. By Dr. John Lowe. 3. Report on the Cinchona Plantations at Darjeeling. By Dr. Thomas Anderson. Dr. Balfour noticed the discovery of *Lepidium Draba* near Burntisland, by Mr. James G. Black, and exhibited specimens.



M.C.C. del. _ E. Cooke, lith.   Vincent Brooks, Imp.



M.C.C. del. _ E. Cooke, lith.

Vincent Brooks, Imp

FOLIICOLOUS SPHÆRIÆ.

By M. C. Cooke.

(Plates L. and LI.)

The classification of the *Sphæriacei* is a subject which has occupied the minds of many mycologists during the past few years, and is still an "open question." Notwithstanding the 'Schema' of Professor de Notaris, and the propositions of M. Tulasne, no one is regarded as a heretic in science who declines to accept the methods of either. Yet it will be generally admitted that a revision of this Order is a fair field for the exhibition of systematic ingenuity, and, if satisfactorily accomplished, would really prove to be an advance in the right direction. It is not clear to my mind, however, that such a change will take place other than through a series of years, gradually and progressively, and not by one Titanic effort. On one point I think the majority of botanists agree, that classification, to be permanently successful, must not be based on the fructification *alone*. On the other hand, it seems very doubtful whether any arrangement in which no regard is given to the fruit will supersede the Friesian system. It is not with the view of proposing any new theory that this paper has been attempted, but the experience derived from close observation in one direction has induced the adoption of one or two genera, more or less generally recognized by Continental mycologists.

For some months during the past winter and spring, my friend Dr. Edward Capron, of Shere, has kindly devoted himself to my service in the examination of all the forms of leaf *Sphæriæ* which we could collect in our respective localities, and the result has been the recognition of several new forms which do not appear to have heretofore been described and figured. This has afforded an opportunity for presenting a synopsis of the British species, as far as they have become known to us; and, inasmuch as the descriptions and figures of those previously included in the British flora were scattered through journals and separate works, beyond the reach of young students, I have ventured to bring them together in the hope that thereby this communication would be rendered more practically useful.

One advantage resulting from the co-operation to which I have already alluded is, that our measurements and figures have been com-

pared together, and no species has been proposed as new which has not been examined independently by both in order to guard against errors of observation. The measurements are expressed in decimals of the French millimetre, on account of its more universal use (Great Britain excepted) and its superior advantages over a higher unit such as the English inch. To meet any objection that microscopists in this country have little knowledge or experience of millimetric admeasurements, the equivalent in decimals of an inch has in many cases been added.

One of the first difficulties which beset our examination, was the determination of the *Sphæria maculæformis* of Persoon. We found also by experience how often maculæform *Sphæriæ* are barren long after the leaves have fallen from the parent tree. Two or three plants with similar external appearances, but with very different fruit, and ultimately others, were examined, any of which might be accepted as agreeing perfectly with the description. Sometimes these occurred on the same and sometimes on different leaves. Neither was our resort to published specimens much more satisfactory, for these did not accord with each other, and, of two species found on the same leaf, there was no evidence which was to be accepted. After some months of close application to the same subject, and the examination of hundreds of specimens, we at least deserve to be free from any charge of arriving at hasty conclusions.

Four plants are now described, and one or two others have been observed, but not with sufficient satisfaction to be included, as possessing more or less the features of *Sphæria maculæformis*, Pers.; that which we have accepted as the type is the one which appeared to us to have the strongest claims to be the most common, and to occur on the largest number of published specimens. This species (Fig. 6)—besides its occurrence on Oak, Elm, and other dead leaves, "in maculam nigram inæqualem conglomeratis"—is also met with scattered over the whole under surface of the leaves of *Castanea vesca*, but, as no difference save that of habit could be discerned, I have regarded it as a variety, under the name of *centigrana*. Another variety was observed, having both cells of the sporidia equal, which I have only recorded as a *variety*, under the name of *æqualis*.

Of the species resembling the above, the nearest is *S. oblivia*, which occurs in groups or clusters on the under surface of the leaves of *Castanea vesca*. The points of difference are chiefly in the fructification.

In *S. maculæformis* the sporidia are ·0075 mm., and in *S. oblivia* ·0125 mm. long. In the former they are straight, in the latter, nearly always, strongly curved, in both the lower cell is the narrowest, but in *S. oblivia* one or two small sporules or nuclei are often present in each cell, which we do not remember to have noticed in the other species. Unless the larger and strongly curved sporidia can be accepted as of specific value, *S. oblivia* must be regarded as a variety of *S. maculæformis*, for differences in habit in a species which is evidently exceedingly variable cannot have weight.

It is only necessary to refer to the figures of *S. simulans* and *S. arcana* to prove, if the fructification is to be accepted as of any specific value, that both these are very distinct.

With *S. punctiformis*, Pers., our difficulty was less, inasmuch as only one rival claimant came under notice, accepting the *S. punctiformis* of authors, and published specimens generally, as the *S. punctiformis* of Persoon. The features which distinguish *S. punctoidea* from *S. punctiformis* are briefly that *S. punctiformis* is hypophyllous, and *S. punctoidea* epiphyllous. The former is scattered all over the surface of the leaf, the latter occurs only in small detached patches. In *S. punctiformis* the asci are clavate, in *S. punctoidea* cylindrical. In the former the asci are ·034 mm., and the sporidia ·009 mm. long, and in the latter the asci are ·056 mm., and the sporidia ·0125 mm. in length. To this may be added that the sporidia of *S. punctiformis* are deeper coloured, and have granular or nucleated contents, whilst those of *S. punctoidea* are uniformly paler, clearer, and more refractive. All these features combined have induced me to propose as a new species the *S. punctoidea* of this communication.

Of the other additions no observation need be made.

The adoption of the genus *Venturia* for such fungi as *Sphæria Eres* and *S. Chætomium*, needs no apology, since it is almost universally accepted by mycologists, and was admitted by Fries in his S. V. S.

Neither do I think that the substitution of *Sphærella* for the *Sphæriæ foliicolæ* of Fries, or at least for that portion in which the perithecia are not rostrate, will encounter much objection. The exclusion of rostellate species is certainly not a distinction based on "the character of the fruit alone," and appears to us perfectly natural. Moreover, we are proposing no novelty, since such an arrangement has long been adopted by many mycologists.

The limits of the present paper forbid me now to include either the rostrate species of leaf *Sphæriæ*, or those included in the genera *Isothea*, *Hypospila*, and *Stigmatea*, but I hope at some future period to revert the genera of Foliicolous Sphæriæ now omitted.

VENTURIA, *De Not.*

Perithecia fragile, hispid or setulose at the apex. Ostiolum large. Paraphyses none. Sporidia 2-celled, slightly coloured.—De Notaris in Att. vi. riun. scienz. p. 485; Fries, Summ. Veg. Scan. p. 405; Cooke, Brit. Fungi, 2nd edit., pp. 159.

1. VENTURIA DICKIEI. Forming orbicular sori beneath the true cuticle about a line broad. Perithecia at length exposed, subglobose, with an obtuse papillæform ostiolum beset with stiff dark bristles, as long or longer than themselves, springing from a radiating, more or less interwoven stratum, of very obscurely septate brownish threads, amongst which are a few darker and closely articulate. Asci short, subcylindrical, obtuse. Sporidia oblong, short, containing about four nuclei or four regular endochromes, or more properly uniseptate, with two endochromes in each division.—*Sphæria Dickiei*, B. and Br. Ann. Nat. Hist. n. 617, pl. x. f. 8; Berk. Outl. p. 395; Cooke, Index, n. 2179. *Lasiobotrys Linnææ*, Dickie, mss.; Berk. Outl. p. 404; Cooke, Index, n. 3011. *Venturia Dickiei*, De Not. Schema, p. 51.—On leaves of *Linnæa borealis*. (Pl. XLIX. Fig. 1.)

2. VENTURIA ERES. Scattered over the leaves and quite superficial, attached by a few hyaline creeping threads. Perithecia globose, beset with very long radiating, rigid, somewhat pellucid, articulated bristles, which are black to the naked eye, but purplish-brown under the microscope; when young their apices are often swollen. Asci rather short, clavate. Sporidia biseriate, oblong-elliptic, about four times as long as broad.—*Sphæria Eres*, B. and Br. Ann. Nat. Hist. n. 621 (Pl. IX. Fig. 4); Berk. Outl. p. 395; Cooke, Index, n. 2195. *Venturia Eres*, De Not. Schema, p. 51.—On dead leaves of *Carices*. (Pl. XLIX. Fig. 2.)

3. VENTURIA CHÆTOMIUM. Hypophyllous, rarely epiphyllous. Perithecia very minute, superficial, scattered or gregarious, subglobose, collapsed when dry, black, covered with rigid divergent hairs, ostiolum papillate. Asci nearly spindle-shaped. Sporidia oblong, straight or slightly curved, containing four sporules or nuclei, ·007 mm. (·00027 in.)

long.—*Sphæria chætomium*, Corda, Icones. Fasc. ii. t. 13. f. 102; Berk. and Br. Ann. Nat. Hist. n. 620; Berk. Outl. p. 395; Cooke, Index, n. 2194. *Chætomium pusillum*, Fries, Scl. Suec. n. 272. *Sphæria exosporioides*, Desm. Pl. Crypt. n. 126. *Venturia chætomium*, De Not. Schema, p. 51.—On dead leaves of *Carex pendula*. (Pl. XLIX. Fig. 3.)

4. VENTURIA MYRTILLI, *n. sp.* Amphigena, superficialis. Peritheciis globosis, atris, pilis longis rigidis vestitis. Ascis ventricosis supra attenuatis. Sporidiis biserialibus vel confertis, uniseptatis vix constrictis, infra attenuatis.—Scattered over either surface. Perithecia globose, black, covered with long rigid hairs. Asci ventricose, attenuated upwards. Sporidia biseriate or crowded, uniseptate, obtuse above, attenuated below, hyaline, ·01 mm. (·0004 in.) long. (Pl. XLIX. Fig. 4.)—On semi-putrid leaves of *Vaccinium Myrtillus*. Shere, Surrey (Dr. E. Capron).

5. VENTURIA ILICIFOLIA, *n. sp.* Epiphylla (forsan amphigena), superficialis. Peritheciis minutis subglobosis atris, pilis rigidis vestitis. Ascis subfusiformibus, minutissimis. Sporidiis biseriatis, anguste lanceolatis, uniseptatis, vix constrictis, hyalinis.—Scattered over the upper surface (perhaps also on both surfaces) superficial. Perithecia minute, subglobose, black, clad with long rigid divergent hairs. Asci subfusiform, minute, ·02 mm. (0008 in.) long. Sporidia biseriate, narrowly elliptic or lanceolate, uniseptate, scarcely constricted, ·008 mm. (·0003 in.) long. (Pl. XLIX. Fig. 5.)—On semi-putrid leaves of Holly. Shere, Surrey (Dr. E. Capron).

SPHÆRELLA.

Perithecia membranaceous, immersed or semi-immersed, scarcely papillate. Sporidia elliptical or oblong, two- or more-celled, rarely simple, hyaline, pale or colourless.—De Not. Schema, p. 62. *Sphæria* (*Foliicolæ*), Fr., in part. Cooke, Brit. Fungi, edit. 2, p. 159.

1. SPHÆRELLA MACULÆFORMIS. Hypophyllous. Perithecia innate but slightly prominent, punctiform, globose, black, crowded together into an unequal spot (or scattered). Asci small, cylindrical. Sporidia uniseriate or biseriate, uniseptate, the lower cell narrower than the upper, ·0075 mm. (·0003 in.) long.—*Sphæria maculæformis*, Pers. Syn. p. 90; Fr. Sys. Myc. ii. p. 524; Berk. Eng. Fl. v. pt. 2. p. 278;

Outl. p. 401; Cooke, Index, n. 2386; Johnst. Fl. Berw. ii. p. 129. —On fallen leaves, very common. (Pl. XLIX. Fig. 6.)

Var. *α. centigrana.* Perithecia scattered.—On dead leaves of *Castanea vesca.*

Var. *β. æqualis.* Perithecia cæspitose. Sporidia having both cells nearly globose and equal. (Pl. XLIX. Fig. 7.)

2. SPHÆRELLA OBLIVIA, *n. sp.* Peritheciis semi-innatis, nigris, agglomeratis, maculæformibus. Ascis cylindricis. Sporidiis biseriatis, curvatis, uniseptatis, infra cellula angustissima est, pallido-flavidis.—Perithecia semi-innate, black, closely agglomerated in small but dense maculæform spots consisting of from ten to twenty individuals. Asci cylindrical. Sporidia biseriate, curved, uniseptate, the lower cell the narrowest, slightly yellow, ·0125–·015 mm. (·0005–·0006 in.) long.—On the under surface of dead chestnut leaves, mixed with *S. maculæformis.* Darenth Wood, Kent. (Pl. XLIX. Fig. 8.)

3. SPHÆRELLA ARCANA, *n. sp.* Hypophylla. Peritheciis minutis, subinnatis, agglomeratis, sparsisve, nitidis, atris. Ascis late fusiformibus. Sporidiis congestis, linearibus, rectis, uniseptatis.—Perithecia minute, subinnate, either collected in "maculæform" spots or scattered, black and shining. Asci broadly fusiform. Sporidia crowded, linear, straight, obtuse at the extremities, uniseptate, each cell containing two small sporules or nuclei, ·0125 mm. (·0005 in.) long.—*Sphæria maculæformis* on *Castanea*, Fckl. Fung. Rhen. n. 817.—On dead leaves of *Castanea vesca.* Darenth Wood, Kent. Intermixed with *S. oblivia* and *S. maculæformis.* (Pl. L. Fig. 13.)

4. SPHÆRELLA SIMULANS, *n. sp.* Hypophylla. Peritheciis innato-prominulis, globosis, minutis, nigris, in maculam nigram inæqualem conglomeratis. Ascis cylindricis, rectis vel flexuosis. Sporidiis elongatis, curvulis, obtusis, confertis, uniseptatis, hyalinis.—Perithecia arranged in groups on the under surface, in a similar manner to *S. maculæformis,* the habit of which it seems to counterfeit, and is often found on the same leaf. Asci cylindrical, containing the large sausage-shaped uniseptate sporidia, in which it differs materially from any of its allies. Length of the sporidia ·02 mm. (or ·0008 in.)—On dead Oak leaves. Highgate, 1866. (Pl. XLIX. Fig. 12.)

5. SPHÆRELLA PUNCTIFORMIS. Scattered. Perithecia innate, punctiform, even, rather shining, black, slightly prominent, umbilicate by collapsion. Asci minute, clavate. Sporidia uniseriate or biseriate,

hyaline, elliptical, obtuse at either extremity, granular, greenish-yellow. Length of asci ·034 mm. (·0013 in.); of sporidia ·009 mm. (·00035 in.). —*Sphæria punctiformis*, Pers. Syn. p. 90; Fr. Sys. Myc. ii. p. 525; Berk. Eng. Fl. v. pt. ii. p. 279; Berkl. Outl. pp. 401; Cooke, Index, n. 2385; Johnst. Fl. Berw. ii. 130. *Cryptosphæria punctiformis*, Grev. Fl. Ed. p. 362 (in part). *Sphæria subconfluens*, Sow. Eng. Fung. (in part).—On dead leaves. Common. (Pl. L. Fig. 14.)

6. Sphærella punctoidea, *n. sp.* Epiphylla. Peritheciis atris, nitidis, innato-prominulis, in maculas minores collectis, demum collapsis e concavis. Ascis cylindricis, curvatis vel flexuosis. Sporidiis uniseriatis, ellipticis l. subcymbiformibus, hyalinis.—Perithecia black, shining, semi-innate, prominent, disposed in little groups of seven or eight on the upper surface of leaves, collapsed and concave when dry. Asci cylindrical, curved or flexuose. Sporidia uniseriate, elliptical or subcymbiform. Hyaline, highly refractive and colourless. Length of asci ·056 mm. (·0021 in.), of sporidia ·0125 mm. (·00045 in.).—On the upper surface of Oak leaves. Shere, Surrey (Dr. E. Capron). Jedburgh (Mr. Jerdon).—Quite distinct from *S. punctiformis*, with which it has probably been confounded: the asci are cylindrical, the sporidia are longer, and the perithecia are different in habit and disposition, always occurring in small groups and on the upper surface only. *S. maculæformis* often occurs on the under surface of the same leaf. (Pl. XLIX. Fig. 9.)

7. Sphærella myriadea. Epiphyllous. Perithecia very minute, numerous, black, aggregated in large unequal cinereous patches. Asci subfusiform. Sporidia biseriate, elongated, triseptate, pointed at each extremity, ·035 mm. (·0013 in.) long.—*Sphæria myriadea*, DC. Fl. Fr. vi. p. 145; Duby, Bot. Gall. ii. p. 710; Desmz. Mem. Soc. Roy. de Lille, 1843; West. & Wall. Herb. Belge, n. 73.—On dead Oak leaves. Shere, Surrey. (Pl. XLIX. Fig. 10.)

8. Sphærella millegrana, *n. sp.* Epiphylla. Peritheciis minutis, sparsis, numerosis, innatis, globosis, atris. Ascis brevibus, cylindricis. Sporidiis linearibus, uniseptatis, cellula supra incrassata, hyalinis.—Epiphyllous. Perithecia scattered, numerous and minute, somewhat resembling those of *S. myriadea*, but not so closely aggregated, and not collected in definite patches. Asci short, cylindrical. Sporidia crowded, linear, and uniseptate, the upper cell being ventricose. ·015 mm. (·0006 in.) long. (Pl. L. Fig. 15.)—On the upper

surface of dead leaves of Hornbeam. Shere, Surrey (Dr. E. Capron).

9. SPHÆRELLA LATEBROSA, *n. sp.* Hypophylla. Peritheciis sparsis, innato-prominulis, minutis, globosis, nigris. Ascis cylindricis, ventricosis. Sporidiis elongato-lanceolatis, rectis vel curvulis, uniseptatis, hyalinis; cellulâ quâque sporulas duas continente. (Pl. L. fig. 16.)—Hypophyllous. Perithecia scattered over the surface, innate, minute, globose, black, scarcely visible till the epidermis is destroyed by exposure. Asci cylindrical, ventricose. Sporidia elongated, uniseptate, constricted at the septum, attenuated towards each extremity, with two sporules in each cell, ·05 mm. (·002 in.) long.—On dead leaves of Sycamore. Shere (Dr. E. Capron).

10. SPHÆRELLA ACERIFERA, *n. sp.* Hypophylla. Peritheciis sparsis, innatis, globosis, minutis, atris. Ascis late cylindricis. Sporidiis uniseriatis, acuminato-ellipticis (amygdaliformibus), hyalinis, cellulâ quâque sporulas duas continente.—Hypophyllous. Perithecia scattered, innate, globose, minute, black. Asci broadly cylindrical. Sporidia large (three times as long as broad), almond-shaped, hyaline, containing two sporules or nuclei, ·02 mm. (·0075 in.) long.—On dead leaves of *Acer campestre*. Shere, Surrey (Dr. E. Capron). (Pl. L. Fig. 18.)

11. SPHÆRELLA CARPINEA. Hypophyllous. Perithecia gregarious, innate, at first covered, black, commonly scattered over the entire leaf. Asci subclavate. Sporidia biseriate, broadly and shortly cymbiform, the least curved side being a little hollowed out towards either apex, ·015 mm. (·0005 in.) long.—*Sphæria carpinea*, Fr. Sys. Myc. ii. p. 523; Desm. Pl. Crypt. n. 981; Berk. and Br. Ann. Nat. Hist. n. 655; Berkl. Outl. pp. 401; Cooke, Index, n. 2382. *Ascospora carpinea*, Fr. Summ. 425; Rabh. exs. 365.—On dead leaves of Hornbeam. (Pl. L. Fig. 19.)

12. SPHÆRELLA PINASTRI. Perithecia minute, scattered, globose, depressed, immersed, piercing the epidermis with their short ostiola. Asci clavate. Sporidia crowded, colourless, elliptical, often acuminate. ·0075–·01 mm. (·0003–·0004 in.) long.—*Sphæria Pinastri*, Duby, Bot. Gall. ii. p. 704; Grev. Crypt. Fl. t. 13; Berkl. Outl. p. 399; Currey, Linn. Trans. xxii. p. 324. t. 58. fig. 82; Cooke, Index, n. 2326.—On fallen Fir leaves. (Pl. L. Fig. 27.)

13. SPHÆRELLA INÆQUALIS, *n. sp.* Hypophylla. Peritheciis sparsis, innatis, nigris, globosis, cum pilis rigidis 2–4 coronatis. Ascis

ventricosis, supra attenuatis. Sporidiis biseriatis congestisve uniseptatis supra subglobosis, infra attenuatis, diluto-flavidis.—Hypophyllous. Perithecia scattered, innate, globose, black, surmounted by three or four stiff hairs or setæ which pierce through the epidermis. Asci ventricose, attenuated upwards. Sporidia biseriate or crowded, uniseptate, the upper cell subglobose, the lower cell twice the length of the upper, slightly yellowish. ·013 mm. (·0005) long.—*Sphærella cinerascens*, Fleisch. in Rabh. Fung. Eur. n. 045 (not *S. cinerascens*, Fuckel, Fung. Rhen. n. 824).—On dead leaves of *Pyrus Aria.* Shere, Surrey (Dr. E. Capron). On Ash, Hawthorn, Pear, Apple (M. C. C.). Apparently very common. (Pl. L. Fig. 26.)

14. Sphærella Vaccinii, *n. sp.* Hypophylla. Peritheciis minutis, innatis, numerosis, confertis, in maculas cinereas aggregatis. Ascis subfusiformibus. Sporidiis elongato-lanceolatis, confertis, uniseptatis, hyalinis.—Perithecia minute, innate, black, shining, numerous, crowded together on the under surface in definite cinereous patches, determined by the veins of the leaves. Asci subfusiform, ·04 mm. long. Sporidia elongated, narrow, uniseptate, hyaline, ·018 mm. (·0007 in.) long. (Pl. XLIX. Fig. 11.)—Mixed with *Venturia Myrtilli*, on semi-putrid leaves of *Vaccinium Myrtillus.* Shere, Surrey (Dr. E. Capron).

15. Sphærella Ligustri. Epiphyllous, rarely hypophyllous. Perithecia very minute, numerous, densely scattered, black, subglobose, then collapsing and umbilicate. Asci clavate (·04 mm. long). Sporidia oblong, with three or four sporules, ·01 mm. (·0003 in.) long.—*Sphæria Ligustri*, Rob. Desm. Pl. Crypt. ed. 1. n. 1196; ed. 2. n. 796; Ann. Sc. Nat. (1843) vol. xix. p. 361; Berkl. Outl. p. 401; Cooke, Index, n. 2393.—On dead Privet leaves. (Pl. L. Fig. 22.)

16. Sphærella Eryngii. Amphigenous. Perithecia innate, very small, globose, black, crowded together in brownish spots. Asci large, cylindrical, flexuose. Sporidia biseriate, uniseptate, constricted at the septum, attenuated towards each extremity, colourless, ·02 mm. (·0008 in.) long.—*Sphæria Eryngii*, Fr. in Duby Bot. ii. p. 710; Desm. Pl. Crypt. n. 1300; Berk. and Br. Ann. Nat. Hist. n. 657; Berkl. Outl. p. 401; Cooke, Index, 2387.—On dead leaves of *Eryngium.* (Pl. L. Fig. 21).

17. Sphærella Rusci. Perithecia very numerous, scattered, punctiform, glaucous or bluish-black, rendering the leaf pale, at first covered with the epidermis. Asci linear-clavate. Sporidia biseriate,

oblong, obtuse, 4–5-septate, constricted at the septa, yellowish. ·015–·025 mm. (·0006–·0010 in.) long.—*Sphæria Rusci*, Wallr. Fl. Germ. p. 776; Berk. and Br. Ann. Nat. Hist. n. 639*; Berkl. Outl. pp. 399; Cooke, Index, n. 2325; Currey, Linn. Trans. xxii. pl. lix. fig. 120. *Sphæria atrovirens*, δ. *Rusci*, Berkl. Eng. Fl. v. pt. ii. p. 272; Desm. Pl. Crypt. n. 1281. *Cryptosphæria glauco-punctata*, Grev. Fl. Ed. p. 362. *Sphæria glauco-punctata*, Currey, Linn. Trans. xxii. p. 333, pl. lix. fig. 144. *Sphærella Rusci*, De Not. Schema, p. 63; Erb. Critt. Ital. n. 886; Sferiacei Italici, pl. 95.—On dead *Ruscus aculeatus*. Common. (Pl. L. Fig. 20.)

18. SPHÆRELLA ARAUCARIÆ (*Sphæria Araucariæ*), *Cooke*, in Seemann's Journal of Botany, vol. iv. p. 104, April, 1866, pl. 45, fig. 12.

19. SPHÆRELLA ISARIPHORA, *De Not.* in Seemann's Journ. of Botany, vol. iv. p. 104, April, 1866, pl. 45, fig. 11.

20. SPHÆRELLA LEIGHTONI. Minute, scattered over the upper surface of the leaves, pitchy brown, shining, narrowed into a short conical ostiolum. Asci clavate, sublanceolate. Sporidia oblong-cymbiform, about four times as long as broad, obtuse, scarcely curved. Endochrome at first retracted to either end; a septum is then formed between the two masses, which are at length again divided.—*Sphæria Leightoni*, Berk. and Br. in Ann. Nat. Hist. n. 659. t. xii. fig. 43; Berk. Outl. p. 401; Cooke, Index, n. 2389.—On dead leaves of *Linnæa borealis*, Glen Dole, Clova, 1837. (Pl. L. Fig. 25.)

21. SPHÆRELLA PTERIDIS. Epiphyllous. Spots greyish or none. Perithecia minute, globose, scattered or aggregate, covered with the epidermis. Asci clavate. Sporidia elongated-fusiform, straight or curved, uniseptate, hyaline. ·015 mm. (·0005) long.—*Sphæria Pteridis*, Desm. Pl. Crypt. n. 1295 (not Kunze and Schm. Exs. n. 2, which is *Dothidea*); Berk. and Br. Ann. Nat. Hist. n. 656; Berkl. Outl. p. 401; Cooke, Index, n. 2383.—*Sphæria Litura*, Berk. MSS. *Sphæria punctiformis*, b. *Pteridis*, Fr. Scl. Suec. n. 86 (not *Sphærella Pteridis*, De Not. Sferiacei Ital. tab. 99).—On dead fronds of *Pteris aquilina*. (Pl. L. Fig. 32.)

22. SPHÆRELLA ERYSIPHINA. Epiphyllous. Perithecia scattered, minute, almost superficial, brown, accompanying and mixed with *Sphærotheca Castagnei*. Asci cylindrical. Sporidia uniseriate, hyaline, uniseptate, ·0125 mm. (·0005 in.) long.—*Sphæria erysiphina*, B. and Br. Journ. Hort. Soc. ix. p. 67; Berkl. Outl. p. 401; Cooke, Index, n. 2390.—On living Hop leaves. (Pl. L. Fig. 24.)

23. SPHÆRELLA MICROSPILA. Perithecia scattered, globose, one or more immersed in a minute brown spot arising from the delicate mycelium. Asci cylindrical. Sporidia oblongo-elliptic, uniseptate. ·005–·0127 mm. (·0002–·0005 in.) long.—*Sphæria microspila*, B. and Br. Ann. Nat. Hist. n. 984; Cooke, Index, n. 2373.—On leaves of *Epilobium montanum*. (Pl. L. Fig. 23.)

**Sphæria Ostruthii*, Fr. Obs. i. p. 174. *Ascospora Ostruthii*, Fr. Summ. Veg. Scan. p. 425.

**Sphæria brunneola*, Fr. Sys. Myc. ii. p. 526. *Ascospora brunneola*, Fr. Summ. Veg. Scan. p. 425.

Both these species have been included by some authors with Foliicolous *Sphæriæ*, but hitherto we have not been fortunate enough to meet with asci in either of them.

24. SPHÆRELLA BRASSICÆCOLA. Epiphyllous. Spots orbicular, large, pallid or cinereous, brownish in the centre. Perithecia crowded, circinating, minute, subrotund, black. Asci cylindrical. Sporidia elongated, cylindrical, obtuse at the extremities, hyaline.—*Sphæria Brassicæ*, Berk. and Br. Ann. Nat. Hist. n. 656*, pl. xii. fig. 42. *Asteroma Brassicæ*, Chev. Par. i. p. 449. *Sphæria brassicæcola*, Duby, Bot. Gall. ii. p. 712; Berk. Outl. p. 401; Cooke, Index, n. 2384. *Sphærella brassicæcola*, De Not. Schema, p. 64.—Common on Cabbage leaves, in autumn and spring, but seldom with perfect fruit. (Pl. L. Fig. 17.)

25. SPHÆRELLA RUMICIS. Spots amphigenous, minute, numerous, orbicular, scattered, brown. Perithecia epiphyllous, conglomerate, somewhat innate, very small, globoso-depressed, becoming concave, olivaceous, then black, pierced with a simple pore. Asci large, cylindrical, slightly curved. Sporidia ovate-oblong, obtuse, uniseptate, ·015 mm. (·0006 in.) long.—*Sphæria Rumicis*, Desm. Pl. Crypt. n. 1298; Berk. and Br. Ann. Nat. Hist. n. 658; Berk. Outl. p. 401; Cooke, Index, n. 2388. *Sphæria lichenoides*, Johnst. Fl. Berw. ii. p. 131.—On living Dock leaves. Abundant. (Pl. L. Fig. 28.)

26. SPHÆRELLA ANARITHMA. Scattered, minute. Perithecia globose, penetrating the cuticle by the small papillæform ostiolum. Asci clavate. Sporidia biseriate, sublanceolate, strongly constricted in the centre, uniseptate. ·03 mm. (·0012 in.) long.—*Sphæria anarithma*, B. and Br. Ann. Nat. Hist. n. 893; Berk. Outl. p. 401; Cooke, Index, n. 2376.—On *Aira cæspitosa*. (Pl. L. Fig. 29.)

27. SPHÆRELLA RECUTITA. Hypophyllous. Perithecia aggregate, innate, slightly prominent, very minute, black, forming long parallel striæ. Asci clavate. Sporidia linear, or narrowly fusiform with five septa, ·015 mm. (·0006 in.) long.—*Sphæria recutita*, Fr. Sys. Myc. ii. p. 524; Berk. Eng. Fl. v. pt. ii. p. 278; Berk. Outl. p. 401.—On grasses. (Pl. L. Fig. 30.) *Note.* Not having by me an authentic specimen of *S. recutita*, the description of fruit, and figures, have been given from specimen published in Rabenhorst's Fungi Eur. Exs. no. 740, which appears to be doubtful (see 'Hedwigia,' 1865, p. 154).

Sphæria duplex, Sow., may belong to this series, but at present I have not had the opportunity of examining specimens.

28. SPHÆRELLA LINEOLATA. Amphigenous, erumpent, with a brownish stroma. Perithecia very small, disposed in lines. Asci clavate. Sporidia oblong, with from three to five sporules or nuclei. ·0125 mm.—*Sphæria lineolata*, Roberge in Desm. Pl. Crypt. n. 1263; Berk. and Br. Ann. Nat. Hist. n. 616; Berk. Outl. p. 399; Cooke, Index, n. 2331. *Sphærella lineolata*, De Not. Schema, p. 63.—On *Ammophila arundinacea*. (Pl. L. Fig. 31.)

EXPLANATION OF PLATES.

PLATE L.—Fig. 1. *Venturia Dickiei*; *a*, leaf with its parasite; *b*, perithecium magnified; *c*, ascus and sporidia × 320. Fig. 2. *Venturia Eres*; *a*, portion of leaf with its parasite; *b*, perithecium slightly magnified; *c*, ascus and sporidia × 320; *d*, sporidia. Fig. 3. *Venturia Chætomium*; *a*, portion of leaf with its parasite; *b*, perithecium slightly magnified; *c*, ascus and sporidia; *d*, sporidia × 500. Fig. 4. *Venturia Myrtilli*; *a*, leaf with its parasite; *b*, perithecium slightly magnified; *c*, ascus and sporidia; *d*, sporidia × 320. Fig. 5. *Venturia ilicifolia*; *a*, portion of leaf with its parasite; *b*, perithecium; *c*, ascus and sporidia; *d*, sporidia × 500. Fig. 6. *Sphærella maculæformis*; *a*, portion of leaf with its parasite; *b*, asci and sporidia; *c*, sporidia × 320; *d*, sporidia × about 500. Fig. 7. *Sphærella maculæformis*; *a*, portion of leaf with variety *centigrana*; *b*, asci and sporidia of variety *æqualis*; *c*, sporidia of same × 320; *d*, sporidia × about 500. Fig. 8. *Sphærella oblivia*; *a*, portion of leaf with its parasite; *b*, ascus and sporidia; *c*, sporidia × 320; *d*, sporidia × about 500. Fig. 9. *Sphærella punctoidea*; *a*, portion of leaf with its parasite; *b*, asci and sporidia; *c*, sporidia × 320; *d*, sporidia × about 500. Fig. 10. *Sphærella myriadea*; *a*, portion of leaf with its parasite; *b*, ascus and sporidia; *c*, sporidia × 320; *d*, sporidium × about 500. Fig. 11. *Sphærella Vaccinii*; *a*, leaf with its parasite; *b*, portion of same slightly magnified; *c*, asci and sporidia; *d*, sporidia × 320; *e*, sporidium × about 500. Fig. 12. *Sphærella simulans*; *a*, portion of leaf with its parasite; *b*, ascus and sporidia; *c*, sporidia × 320; *d*, sporidia × about 500.

PLATE LI.—Fig. 13. *Sphærella arcana*; *a*, ascus and sporidia; *b*, sporidia × 320; *c*, sporidium × about 500. Fig. 14. *Sphærella punctiformis*; *a*, asci and sporidia; *b*, sporidia × 320; *c*, sporidia × about 500. Fig. 15. *Sphærella millegrana*; *a*, asci and sporidia; *b*, sporidia × 320; *c*, sporidium × about 500. Fig. 16, *Sphærella latebrosa*; *a*, ascus and sporidia; *b*, sporidia × 320;

c, sporidium × about 500. Fig. 17. *Sphærella brassicæcola; a*, spot with arrangement of perithecia; *b*, asci and sporidia; *c*, sporidia × 320. Fig. 18. *Sphærella acerifera; a*, ascus and sporidia; *b*, sporidia × 320. Fig. 19. *Sphærella carpinea; a*, ascus and sporidia; *b*, sporidia × 320. Fig. 20. *Sphærella Rusci; a*, ascus and sporidia; *b*, sporidia × 320. Fig. 21. *Sphærella Eryngii; a*, ascus and sporidia; *b*, sporidia × 320; *c*, sporidium × about 500. Fig. 22. *Sphærella Ligustri; a*, leaf with its parasite; *b*, asci and sporidia (immature); *c*, sporidia × 320. Fig. 23. *Sphærella microspila*; *a*, ascus and sporidia; *b*, sporidia × 320. Fig. 24. *Sphærella erysiphina; a*, ascus and sporidia; *b*, sporidia × 320; *c*, sporidia further magnified. Fig.2 5. *Sphærella Leightoni; a*, ascus and sporidia; *b*, sporidia × 320. Fig. 26. *Sphærella inæqualis; a*, section of perithecium (enlarged); *b*, asci and sporidia; *c*, sporidia × 320; *d*, sporidia further magnified. Fig. 27. *Sphærella Pinastri; a*, ascus and sporidia; *b*, sporidia × 320. Fig. 28. *Sphærella Rumicis; a*, spot with arrangement of perithecia (enlarged); *b*, asci and sporidia; *c*, sporidia × 320. Fig. 29. *Sphærella anarithma; a*, ascus and sporidia; *b*, sporidia. Fig. 30. *Sphærella lineolata; a*, portion of leaf with perithecia; *b*, ascus and sporidia; *c*, sporidia × 320. Fig. 31. *Sphærella recutita; a*, portion of leaf with its parasite; *b*, ascus and sporidia; *c*, sporidia × 320. Fig. 32. *Sphærella Pteridis; a*, ascus and sporidia; *b*, sporidia × 320.

SOME REMARKS ON THE CLASSIFICATION OF FERNS.

By H. F. Hance, Ph.D., etc.

At page 15 of the present volume of this Journal is a note by Mr. John Smith in controversion of the views I had expressed, in the preceding volume, on the systematic position of the genus *Brainea*. The special attention Mr. Smith has for so many years devoted to Pteridology naturally renders any observations he may make of interest; and his opinions are always entitled to the highest respect. But I cannot say that his remarks have in any way shaken the conviction I had expressed as to the real affinities of *Brainea*. I had endeavoured to show that this genus and its immediate allies in the tribe *Gymnogrammeæ* are represented amongst *Lomarieæ* by precisely analogous forms; and those to whom the Ferns I mentioned are unfamiliar, will, I think, be able to satisfy themselves, to some extent, of the justness of my opinion, by a reference to the plates of Fée's 'Genera Filicum,' or the very neat analytical figures in Mr. Moore's 'Index.' Mr. Smith writes:—"I admit that *Sadleria* and *Brainea* are a perfect instance of parallelism; but I must confess, in all my study of the relationship of Ferns, it never came into my mind that there was any connection between *Blechnum* and *Gymnogramme*, or *Woodwardia* and *Dictyogramme*. . . . On the other hand, it is easy to see that *Brainea, Sadleria, Lo-*

maria, and the whole of *Blechnum* are of the same lineage, and quite unconnected with *Gymnogramme*." Now, there is here a singular confusion of ideas. After recognizing the "parallelism" of *Sadleria* and *Brainea* in one sentence, Mr. Smith proceeds in the next to place the two together, as of the same lineage; that is to say, he very evidently confounds *analogy* with *affinity*. With respect to the relationship which Mr. Smith insists to be so manifest and easy of recognition, the obvious reply is, that neither Professor Mettenius nor the late Sir William Hooker perceived it; and I may be allowed to say that I feel an equal inability. Mr. Smith further writes:—"If the Darwinian theory of the origin of what is called species from antecedent species be admitted as a guide to assist in determining affinity, then the Cycad-looking stem of *Brainea* should be compared with that of humble Gymnograms." If I apprehend rightly Mr. Smith's meaning in these words, it is that nearly-allied genera should agree in habit; and, that the arborescent caudex of *Brainea* is a fatal objection to its close alliance with *Gymnogramme*. Though not myself, by any means, a decided opponent of the remarkable theory which, through the learning, the unrivalled power of illustration, and the rare and scrupulous candour of Mr. Darwin, has made so deep an impression on all thoughtful students of natural science, I might object to the *petitio principii* involved in assuming a very generally disputed hypothesis as the basis of an argument; but, in cases where numerous facts contradict the presumption expressed, we may safely keep to the facts, and leave theories aside. I do not myself see that *Woodwardia radicans*, Sw., *Lomaria Spicant*, Desv., *Blechnum lanceola*, Sw., or any species of *Doodya*, can in any sense be called less humble than such Ferns as *Gymnogramme japonica*, Desv., *G. javanica*, Bl., or *G. trifoliata*, Desv.; or less dissimilar in habit to *Brainea*, by the side of which Mr. Smith ranges them. And, amongst flowering plants, in such a truly natural genus as *Euphorbia*, to give an example, it is only necessary to advert to such species as *E. neriifolia*, L., *E. tirucalli*, L., *E. palustris*, L., and *E. thymifolia*, Burm.; or, in the order *Urticaceæ*, to such a plant as *Laportea gigas*, Wedd., as compared with *L. Canadensis*, L., or *L. bulbifera*, S. and Z., to show how destitute of foundation is the assumed test; since here it is allied species which differ in habit more than many allied genera. I cannot assent to Mr. Smith's opinion that the absence of an indusium in *Brainea* is of no weight against his view

of its affinities, as "being analogous to the want of indusia in closely allied species of *Phegopterides*." The firm, coriaceous, extended, linear indusium of the *Lomarieæ*,—very different from the delicate and minute one of many *Aspidia*,—is, in my judgment, far too marked and important a character to be regarded as of subordinate value; and, fully persuaded as I am that our classification of Ferns will hereafter be profoundly modified, I believe, in the present state of our knowledge, that the presence or absence of an indusium is the most important and reliable primary character we can employ. It is true that M. Fée asserts (sub voce *Pleocnemia*) that some Ferns exist under both forms; and I have myself alluded to an apparent example of this kind in *Polypodium urophyllum*, Wall.; but I suspect the truth to be that, if observed when sufficiently young, such Ferns would, in a state of nature, be found always indusiate, although the indusium is often of very delicate texture, and evanescent. *Aspidium amabile*, Bl., *A. Singaporianum*, Wall., and *A. coniifolium*, Wall., are certainly in this case; and it is notorious how many species of that genus have been referred to *Polypodium*, owing to being described from old specimens. I have a wild specimen of *Woodsia (Hypoderris) Brownii*, Mett., in which, after the most careful examination, I have failed to detect a trace of involucre, doubtless from the sori being advanced in age. In a considerable number of *Aspidia* belonging to the *Polystichum* group, and sometimes in *A. javanicum*, Mett., the indusium curls up, and is forced inwards and concealed by the overlapping sporangia, so that plants in full fructification appear nudisorous. If I am correct in my surmise that apparent exceptions to the constancy of this character are due to the caducous nature of the indusium, and not to its absence, then *Polypodium urophyllum* must be transferred to *Aspidium*, with many species of which, in the *Nephrodium* group, it agrees very well; and Mr. Smith's objection would vanish.

Assuredly, the "Saturnia regna" in which botanists shall sit down with anything like accordant views as to the absolute or relative value of different structural characters in Ferns, and the limits of the genera to be admitted, seem very far off indeed; for, whilst Professor Mettenius declares that, after the most scrupulous examination, he is unable to recognise the validity of the numerous genera separated of late years from *Polypodium;* M. Fée asserts the views of the analytical school to be so manifestly superior in forming natural groups, that

even an uninitiated person must recognize the fact. This author has addressed to those who differ from him the singular and unanswerable subjective criticism that "peut-être ont-ils résisté, sans le savoir, à leurs propres convictions;"—relying, apparently, overmuch on the strength of his own. Though candidly acknowledging that analytic pteridologists* have conscientiously worked out their views with great skill, and, granting their premisses, with considerable success, and fully admitting the obligations botanists are under to Messrs. Smith, Fée, and Moore, who have done very much to increase our knowledge; the real question at issue is the relative worth of the principles involved.

I must frankly confess that my own experience convinces me that synthetic notions of genera are the most natural; and I look with the greatest confidence to Professor Mettenius, unquestionably the most philosophical and thorough of living pteridographers, and the head of the synthetic school, who I believe proposes to study and examine all the genera of Ferns in the same manner as he has treated *Polypodium*, *Cheilanthes*, *Aspidium*, etc., to clear up many of the doubts and difficulties which at present beset us. Presl, in his 'Tentamen Pteridographiæ,' while expounding much more moderate analytic views than in his subsequent writings, or than those put forward by the later adherents of the "jeune école," seems also to me to have formed much more natural groups; though I believe the reliance he placed, even in his first work, on venation, which was somewhat plausibly but sophistically defended in an able preface, was very excessive when tested by experience. It must, however, be remembered, in justice to Presl, that in his preface he explicitly observes:—"In Filicaceis genera valorem alium et quidem minorem habent ac genera plantarum phanerogamarum; consideranda sunt nempe priora tanquam subgenera, si eodem mensurantur pondere ac genera Phanerogamarum;" so that there was in effect even more difference between him and his successors than is usually believed. It is scarcely necessary, I imagine, to insist that, to employ the term genus in different divisions of the vegetable kingdom with varying signification, is at once unphilosophical, unnecessary, and inconvenient.

So strongly does all evidence seem to me to point to the reduction

* I except the late Prof. Link,—if, indeed, he should be included in the category,—whose views (as given in Filicum Sp. Hort. reg. Berol., 1841) were far too loose, crude, and unsystematized, to deserve much notice.

rather than to the increase of genera, that, in the face, I believe, of all living pteridographers, I would, without hesitation, merge both *Nephrolepis* and *Oleandra* in *Aspidium*. As to the first group, there is absolutely nothing to separate it, except habit, the articulated pinnæ, and the presence of white scale-like dots near their edges. But similar dots exist on those of *A. albo-punctatum*, Bory, and a few others; and in *A. (Cyclopeltis) semicordatum*, Sw., and its allies, the pinnæ are equally articulated, and the habit is similar, the orbicular not reniform indusium being the only distinguishing mark. My *A. (Cyclopeltis) Kingii*, from the Hogoleu Islands, a portion of the Caroline group, was indeed maintained by Sir William Hooker (in litt.) to be identical with *Nephrolepis obliterata*, Hook., an opinion the groundlessness of which I have elsewhere endeavoured to demonstrate. Moreover a precise analogue of *Nephrolepis* is found among *Lindsææ*, in the rare Malayan *L. lanuginosa*, Wall., which has articulated pinnæ, similar in shape, and provided with intramarginal white dots. Surely, logical consistency should lead the upholders of *Nephrolepis* to accord generic rank to this singular and distinct species,—a course, however, which no one, so far as I am aware, has pursued. The few *Adianta* with articulated pinnules, such as *A. Parishii*, Hook., and *A. fragile*, Sw., are retained by common consent in that genus.

The claims of *Oleandra* to generic distinction repose on its habit, the disposition of its sori, and its articulated stipes. But, so far as regards the two first characters, it is in no wise more different from the pinnate or decompound *Aspidia*, than *Asplenium serratum*, Sw., the species of the *Thamnopteris* section, or *A. lanceum*, Thbg., from those with divided fronds, or than many *Polypodia inter se*; and *Asplenium albo-punctatum*, Bory, has similarly articulated stipes, a peculiarity to which an undue importance seems to be attached by some botanists. I should add that the late Professor Kunze held identical views as to the insufficiency of these characters to warrant the separation of *Oleandra*. The length from the caudex to the articulation of the stipes, the distance of the sori from the costa, the different position of the indusium-sinus with regard to it, the breadth, outline, and greater or less downiness of the frond, varied so much in the copious specimens of my *O. Chinensis* found last year by Mr. Simpson, as to satisfy me that it is inseparable from *O. neriiformis*, Cav.; and I am, indeed, strongly inclined to believe that there is after all but one variable species known.

None of the characters given are at all constant in a number of specimens from the same locality.

With regard to habit, on which M. Fée lays perhaps more stress than any other author, its extreme diversity in the species of such genera as *Asplenium* and *Polypodium* seems the most conclusive proof of the small value to be assigned it; especially when the differences in this respect are by no means coincident or coextensive with others in the venation and the position of the sori.

I avail myself of the opportunity now afforded to make a few remarks on the 'Species Filicum' of the late Sir W. Hooker, at which Mr. Smith has glanced. From the immense materials at the disposal of the illustrious author, the labour and care with which it is prepared, the fulness of the characters, and the very beautiful and life-like figures with which it is so lavishly embellished, this work is incomparably the most important contribution to pteridography which has ever appeared. The weak point of the arrangement appears to me to be the one which led the late Hon. and Rev. Dean Herbert, thirty years ago, in the preliminary treatise to his well-known 'Amaryllidaceæ,' to direct a most telling criticism against a system of classification then recently elaborated by Dr. Lindley; I mean a want of equality or uniformity in the value assigned to characters in the different groups, so that some of the genera are scarcely equiponderant with what are, in other instances, rated as sections. A lengthened interval elapsed between the appearance of the earlier volumes, and in them the genera were worked up with extreme care and thought. The recognition of *Hypoderris* apart from *Woodsia*, from which it is only distinguishable by habit, of *Dictyoxiphium* (since abandoned by its author, but lately restored by Mettenius) apart from *Lindsæa*, of such unstable genera as *Pellæa* and *Ochropteris*, which must surely be absorbed by *Cheilanthes* and *Pteris*, and of *Sadleria*, are so many departures from the principles expressed or tacitly implied by the author. The two concluding volumes were published with unusual rapidity, and bear traces of undue haste, and an apparently less vigorous grasp of the subject, doubtless attributable to the great age the venerable author had attained. The severance of *Nephrodium* from *Aspidium* is eminently unnatural, opposed to the views elsewhere expressed, and based on infinitely less satisfactory ground than would have been the admission of *Humata* and *Prosaptia*, in which the indusia differ far more from those of the

Microlepieæ; and the character relied on seems moreover variable, as well as of subordinate value. Nor can the consistency of recognizing *Fadyenia* and *Drymoglossum* as distinct from *Aspidium* and *Tænitis*, solely because they have dimorphous fronds, be for a moment defended, when it is remembered that *Davallia heterophylla*, Sm., and *D. angustata*, Wall., are retained in that genus, and *Hymenostachys* combined with *Trichomanes;* whilst *Polypodium biforme*, Hook., and *P. quercifolium*, L., might on the same ground equally claim generic rank. *Vittaria* can scarcely be said to have been worked up at all, Fée's monograph having been followed, though the genus is so difficult that the labours of an independent investigator would have been especially welcome. The same may be said of *Antrophyum*, which does not seem separable from *Hemionitis;* and the limits between the latter and *Gymnogramme* are not satisfactory. This last-named genus and *Acrostichum*, as understood by Sir William, seem to include many heterogeneous elements, and certainly require renewed examination and grouping. The difficulty of properly limiting the genera is unquestionably excessive; but they can scarcely stand as they are, and *Platycerium* seems no more entitled to separation than other sections referred to *Acrostichum*. But, admitting these defects, it may well be doubted if any complete view yet given is, as a whole, more natural, with better limited groups or fewer weak points; and, in one most important particular, the natural grouping and sequence of the species,—an eminently difficult task,—the arrangement, in the large genera *Asplenium*, *Aspidium*, and *Polypodium*, appears to me to contrast very favourably with that of Mettenius, in his monograph; as I think will be admitted by any one who will take the trouble to dispose a large suite of plants according to the views of both writers.

Sir William Hooker had undoubtedly devoted a greater number of years to the special study of Ferns than any either of his predecessors or contemporaries. Yet in all his numerous works illustrative of his favourite class, there is no more prominent characteristic than the unvarying modesty with which his own views, and his dissent from the school whose principles diverged so widely from those he held as truth, are stated. He repeatedly and ungrudgingly bore testimony to the learning, and expressed admiration of the ability, of extreme analytic pteridographers, whilst avowing his want of sympathy with their opinions; admitting fully that the subject was one on which he put

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forward no pretension to dogmatize, or to know better than others. In striking contrast to such an honourable diffidence, we have seen some Continental writers,—and those not mere sciolists, but men of unquestioned ability,—criticize with a strangely misplaced ridicule, and an unwarranted affectation of superior knowledge, the speculations of so earnest a truth-seeker as Mr. Darwin,—an author whose scrupulous attention to objections and difficulties is so remarkable, that he certainly often suggested such as would not have occurred spontaneously to his opponents. His abstinence from dogmatism on questions which had so long engaged his attention, whilst one of the most pleasing, is at the same time one of the most honourable characteristics of Sir W. Hooker's writings; and there can be no surer test of an honest devotion to science, as distinguished from a desire of self-aggrandisement through its study, than such a becoming admission of humility, in the face of the great and solemn problems of nature.

British Vice-Consulate, Whampoa,
18*th March*, 1866.

THE INTRODUCTION OF *LEPIDIUM DRABA* INTO BRITAIN.

The introduction of a new plant that takes its rank amongst our own indigenous ones should be carefully noted, or in a few years the generation will have passed away, and sometimes all record of the plant with it. Many of our so-called British plants had doubtless a European origin, and even some came originally from parts of the earth yet more distant. There are many persons yet living, who remember the disastrous Walcheren Expedition; but few are aware that to the effect of this is to be ascribed the introduction of *Lepidium Draba*, the most troublesome weed to agriculturists, saving Gravel Bine, *Convolvulus arvensis*, for, like it, the new-comer dives deeply into the earth, from 8 to 9 feet, and cut it or break it off as you will, new buds are formed and shoots developed that in time will find their way to the surface, luxuriate in leaves and flowers, from which, in due time, seeds are produced and the race extended. All this increase by seed the husbandman can prevent by cutting off the tops; but how is he to rid the soil of the roots thus deeply seated? Again, when the

deeply seated bud has forced up a spindling weakly-looking shoot to the air, the very first effort (in which it is usually successful) is to thrust out lateral thready roots in all directions within from 6 to 12 inches of the surface, and often extending to 6 feet and more. These ramifications are full of buds, and the second year produce a plentiful supply of herbage and flowers, as just recorded. But it is time that I explain its denizenship, and its connection with the Walcheren Expedition. When our troops returned to England many disembarked at Ramsgate; the poor fellows were suffering under malarious fever, and their beds were ripped up and the straw, etc., was placed in an old chalk-pit belonging to a Mr. Thompson. Time passed on, and this heap of refuse was mixed with seaweed and manure, and finally employed to fertilize the fields. Wherever this was done a plentiful crop of the new weed was produced, and which to distinguish it was called Thompson's weed. We have traced its introduction, and its spread over many parts of the Isle of Thanet; it now remains to show its future progress. It seems to take to the edges of ditches, the edges of footpaths, etc., in preference to the open fields, and may be traced through Canterbury, Chatham, and to Sittingbourne, Gravesend, Deptford, Peckham, etc., as I have done; but how far it has reached towards the northern and midland counties I have had no opportunity of ascertaining. It may be well, however, for me to state, that I have measured one root in the chalk where it was originally brought, that was 9 feet long, and then did not reach the extremity. (W. M. in 'Gardeners' Chronicle.')

ON A NEW SPECIES OF TACCA.

By Thos. Nuttall, Esq.

[When lately working up the different species of *Tacca* for my Viti Flora, I was unable to procure a sight of the 'American Journal of Pharmacy' (of which there does not exist a copy at the British Museum, nor a complete set at the Pharmaceutical Society of London, nor, as far as I know, anywhere else in Europe), and I could therefore not clear up the synonymy satisfactorily, owing to *T. oceanica* being described in the ninth volume of that useful periodical. Pro-

fessor Asa Gray has been good enough to obtain for me a transcript of the description and tracing of the figure of *T. oceanica*, known to me only from a reference in Pereira's 'Materia Medica.' As others may find themselves in the same difficulty as I was, it may be desirable to reprint the description. I may add that *T. oceanica* proves identical with Forster's *T. pinnatifida*, and that the Indian plant hitherto included under that name will probably have to receive a new name.—B. SEEMANN.]

Tacca oceanica, maxima, foliis palmato-quinquepartitis coadunatis, laciniis acuminatis, ultimatis trifidis; involucrum foliolis lato-ovatis sublobatis breviusculis.

Habitat.—In rich shady woods, towards the mountains in Tahiti, and probably other of the Friendly Islands, as well as in Wahoo, Owyhee, and Atovi, of the Sandwich group.

Description.—The root consists of numerous yellowish-white-skinned tubers, scattered over with eye-buds like so many potatoes, and are, in fact, scarcely distinguishable from the roots of that common vegetable; from these arise in the summer season, clusters of tall spreading palmately-divided smooth leaves, from two to three feet high, of which length the foot-stalk forms two-thirds or more; the leaf itself extends out to the breadth of eighteen inches or two feet, and is divided into three primary divisions, and two others which are lateral, or come out above the base of the side divisions; these principal divisions are divided very much in the manner of our red oak leaves, or pinnatifid towards the base, and more or less dilated and three-lobed beyond; each of the principal divisions again inclining to be three-lobed, except the central one, which is usually pinnatifid as well as terminally three-lobed; all the divisions end in acuminated points, and are, below, everywhere confluent into each other, down to the primary divisions or summit of the footstalk.

The leaves are probably possessed of some degree of succulence, but the vessels beneath present a strong, almost pinnated outline. The scape or flower-stem, in the only specimen I possess, is very stout, and rather more than three feet high, attenuated towards the umbel, whose involucrum consists of about two series of broad, ovate, acute, and sometimes slightly three-lobed leaves, which appear to have been white, or some brighter colour.

The umbel consists of numerous longish, pedunculated, small, brown

or brownish-red flowers, nearly campanulate, and consisting of a calyx only: within there are six hooded, petaloid, pedicellated bodies, answering both the purposes of petal and filament, each containing and almost concealing (as in the infertile anthers of the Larkspur) the 2-celled anthers.

With the berry and germ I am unacquainted. As in the *T. pinnatifida*, there are interspersed among the flowers numerous abortive filiform peduncles, which form a crinite tuft extending far beyond the flowers. The root of this plant, or the tubers, when pounded and washed, afford a fecula, which, under the name of Pia, is used extensively in the Sandwich Islands as an article of food, and goes among the white residents usually by the name of Arrow-root.

The present species is readily distinguished from that of India, by the broader, more divided, and coadunate leaves, as well as by the short and broad leaves of the involucrum; it is also, apparently, a larger plant in all its parts, save the flowers.

A NEW BRITISH STATION OF *WOLFFIA ARRHIZA*.

Mr. M. Moggridge has been fortunate enough to discover a new station of *Lemna*, or rather *Wolffia arrhiza*. He found it on July 7, in a pool in the second field south-east of St. James's Church, Walthamstow, Essex. The plant being smaller than a pin's head, and occurring in company of other Duckweeds, has probably been overlooked in many localities, and it is highly desirable that our correspondents should carefully examine their respective neighbourhoods with a view of finding this new British plant. We shall be glad to insert any communications on the subject that may be forwarded, so that the geographical range of this species may be worked out. That it is not a recent importation to our islands appears from the subjoined letter.

British Museum, July 28, 1866.

About fifty years ago Mr. Bennett and myself had some specimens of *Lemna arrhiza*, brought to us as having been discovered in the neighbourhood of London, I believe Putney Common. It was collected by M. Gérard, an old Frenchman, who had been head gardener at Versailles, but had emigrated at the first revolution. He was a good botanist, and supported himself by collecting plants and selling

them to botanists, and by supplying lecturers with specimens for demonstration. M. Gérard maintained that it was *Lemna arrhiza*, but we were inclined to think that it was most likely only a very young state of *Lemna minor*, for the difference in the fructification between the two plants had not then been described; and though M. Gérard had brought me *Lemna minor* in flower, the *Lemna arrhiza* was not in that state, or at least the stamens were not to be seen when I received it.—Yours, etc.,

J. E. Gray.

VEGETABLE PRODUCTS OF THE TOCUYO RIVER.

There are several species of indigenous Palms, and one, the Cocoanut, is cultivated to some extent. Nearly all the houses are thatched with the leaves of the Palma redonda (*Copernicia tectorum*), and from the same material straw hats are made. An excellent beverage, resembling champagne, and quite as intoxicating, is made of the Palma or Corozo de vino (*Acrocomia sclerocarpa*) by felling the trunk, and cutting a hole just below the crown of the leaves. When I was at Guadima, the people had cut down several of these spiny Palms in order to supply themselves with "wine" for the Easter holidays. More useful still is the Mapora, or Cabbage Palm (*Oreodoxa oleracea*), which attains sixty feet in height, and is one of the leading trees on the banks of the Tocuyo. The young leaves yield an excellent cabbage, which is so highly esteemed in the West Indies, where the tree has become scarce, that they are sent as acceptable presents from one island to another. The full-grown leaves are used for thatching, but by far the greatest value of this Palm consists in the wood, which is esteemed in Venezuela for shingling. A full-grown tree, I am told, will often yield 100 planks (each 6–7 varas long and 1 inch thick), and 100 of these planks sell, on the banks of the river, for 36*s*., and in Porto Cabello for £3 or £3. 15*s*. One of the most common trees is the Mora (*Broussonetia*, or *Morus tinctoria*), which yield the dyewood known as Fustic in commerce. A ton of this wood brought to the river bank is paid for in Tocuyo at the rate of £1. 4*s*. (8 pesos del pays), and fetches in Liverpool from £5 to £6. It is a quickly growing tree of middle size, only the heart of which is used, and the fruit is eaten by the children. Guayacan (*Guaiacum officinale*) is found in

considerable abundance. It is sold on the banks of the river for 15*s.* the ton, and at San Miguel de Tocuyo for £1. 1*s.* to £1. 4*s.* per ton. The tree yielding the so-called "Balsam of Tolu" (*Myrospermum toluiferum*) is sufficiently common to be of commercial importance. The natives call it "Balsamo," and attach great value to the resin obtained from the pods. The resin exuding from the stem now sells in London at the rate of 4*s.* per pound. An allied species, known as Sereipo in the country (*Myrospermum frutescens*), is equally common. The balsam produced by this tree is entirely neglected. The wood has, however, been exported; and Mr. Polly, of Porto Caballo, was named to me as one of those who sent considerable quantities of it to Hamburg. The Castor-oil plant, or Tartago (*Ricinus communis* and *R. inermis*), is seen about all the settlements, and supplies the inhabitants with oil for their lamps, the wicks of which are made of home-grown cotton. It seems to be the only oil-yielding plant of the district, of which I noticed three distinct varieties. Sarsaparilla (*Smilax* sp.) is seen wherever the forest is not too thick; and a species of Vanilla (*Vanilla* sp.), somewhat inferior to the cultivated one, yet sufficiently good for export), is frequently met with, and, to some extent, collected by the natives. In times of scarcity the people make bread of the root-stock of a palm-like plant (*Zamia muricata*), and they also eat the farinaceous root-stock of a white Water-lily (*Nymphæa ampla*), which they call "Naya." About Guadima and the upper hills all the streams are full of water-cresses. Crin vegetal, or Vegetable Horsehair (*Tillandsia usneoides*), covers some of the trees in the greatest profusion, and is used for stuffing sofas, mattresses, cushions, etc. The fruits cultivated are,—nisperos, bananas, plantains, tamarinds, papaws, soursops, breadfruit, cocoa-nut, cacao, coffee, etc. The esculent roots principally grown are,—sweet potatoes, yams, taros, cassava root (two kinds), etc. The only grain I noticed was Indian corn, or maize.—*B. Seemann, Report on the Tocuyo Estate of Venezuela*, p. 21.

CORRESPONDENCE.

The Corona of Narcissus.

Mr. W. G. Smith's views on the morphological nature of the corona of *Narcissus*, as laid before the Botanical Congress, and subsequently published in the

'Journal of Botany,' coincide very closely with those advanced by Link, Schleiden, and at one time by Gay. Not to occupy your space with well-worn controversial matter, I would again merely refer for the history of the subject to M. Gay's papers, in the 6th and 7th volumes of the 'Bulletin of the Botanical Society of France,' and to the brief summary that I have prefixed to my former communication on this subject, Journ. of Botany, vol. iii. p. 105.

Considered abstractedly, there is of course no reason why petals should not be provided with appendages, "ligules" as Schleiden calls them, or rather as his translator renders the term; and no reason why they may not become confluent into a "corona." However true this may be in some cases, it is not correct, I believe, in this particular instance. Nor can I agree with Mr. Smith that it is indefensible to account for "the presence of the corona by a duplication or triplication of the perianthial segments, or an imperfect condition of an additional series of stamens or two series." Mr. Smith's words, which I now quote, are very plausible,—so much so, that they will no doubt carry conviction to those who read them without having perused what has been written by others, or who have not investigated the matter for themselves. "There is," says the gentleman to whom I have just referred, "as much reason to suppose the corona an abnormal growth of an additional series of the perianth, when it is petal-like, as it is to suppose it an abnormal condition of another series of stamens, or two series when it bears anthers." Now, on the surface this is so reasonable, that no one could withhold assent; when the relative position, and especially when the anatomical conformation of any supplementary organ coincides with those proper to the petals or to the stamens, as the case may be, it is surely "defensible" to consider such supplementary organ to be a modification of a petal or a stamen, etc.; and so if, in certain flowers, the corona puts on more or less of the appearance of the anther-lobe, one is justified in considering the corona to be a modification of the anther-lobe; the latter is constant and as it were perfect; the former is exceptional, transitional, and rudimentary.

In Mr. Smith's own figures (t. 47. f. 9), I find evidence of a similar structure to that which I myself drew attention. There is in the figure to which I have just referred a stamen whose connective is relatively very large and petal-like and which bears on either margin, near the base, two corona-like processes which I should look on as rudimentary anther-lobes. I do not know whether these have escaped Mr. Smith's notice; if they have done so, he might fairly have considered the supernumerary segment to be an adventitious petal.

As to the term "stipule," every morphologist will admit that under this head several widely-different things have been and are grouped together; and therefore until the true nature of the so-called "petal-stipules" shall be better understood than it is at present, it will be preferable to make use of some general term, such as scales or corona. Not having examined the stigma of *Sarracenia* in a fresh state, I am hardly in a position to definitely assent to or dissent from the analogy drawn by Mr. Smith between that organ and the leafy stipules of *Trifolium*, the petal-scales of *Silene*, or the dilated filaments of *Ornithogalum*; but I cannot help expressing a surmise that more extended ob-

servation will show that the analogy between these several organs is more remote than Mr. Smith seems to consider.

That flowers may and do become "double" by the adventitious development of appendages on their petals by a sort of prolification, or rather by over-luxuriant growth (for the term prolification should be strictly confined to those cases in which an adventitious bud is formed), I freely admit, though in none of the treatises on this subject, so far as I am aware, is this mode of doubling alluded to. Mr. Berkeley has seen something of the kind in double Primroses, but I believe most of these cases may more correctly be referred to a modification of the anther structure.

For the present, at least, I consider the explanation of the formation of the corona of *Narcissus*, as offered by Lindley, Gay, and Morren, to be nearer to the truth than any other yet given, though it is unfortunately not so simple as that offered by Mr. Smith, and indeed has led a writer in a contemporary (probably by an oversight, though it might serve for a pun) to assert that I consider the corona as a series of "mystified stamens"!

MAXWELL T. MASTERS.

Tree-Vegetation of Australia.

As one of the Commissioners for the Intercolonial Exhibition, I am called upon to prepare an essay on the vegetation of all Australia, especially in reference to the resources of the country. As one item of interest, this essay will embrace an enumeration of *all* the trees of Australia, as far as known, so tabulated that at a glance it may be seen what species are peculiar to each colonial territory. The tree-vegetation, moreover, impresses on each flora its main physiognomy and points largely to its affinity. Thus, no tree of New Zealand is identical with Australian species, and thus a greater discrepancy becomes apparent between the flora of New Zealand and Australia than between that of India and our continent. If lists of the trees of *any* part of the globe could be carefully and extensively compiled, undoubtedly very many interesting data, not only for phytogeography, but also for industry and commerce, would be obtained.

I am, etc.,

FERDINAND MUELLER.

Melbourne, 26*th February*, 1866.

Callitris (Frenela) Parlatorei, *F. Muell.*

This new coniferous tree was recently discovered by Walter Hill, Esq., the Director of the Botanic Garden of Brisbane, at the Darlington Range of Queensland, where it attained a height of fully 60 feet. In its character it approaches nearest to *Callitris Gunnei* and *C. fruticosa*. It shows the coarse foliage of both, but the partitions of the branchlets are shorter than in *C. Gunnei*. From the latter, moreover, this new species is readily recognized by *the pointed fruit-valves, which are quite of equal length.* From *Callitris fruticosa* it differs besides in having no protuberances on the dorsal apex of the valves.

Callitris actinostrobus (F. M., Essay on the Pl. of the Burdek. Exp. 19) is also closely allied to this new congener, so far as the equally 6-valved fruit is concerned; but the number of seeds remove the Sandarock Pine from the section *Actinostrobus* of *Callitris*, and bring it to the *Frenela* group. The seeds, not seen ripe, are seemingly 2-winged. The species is to bear the name of the illustrious Italian phytologist, who is now engaged in working up the noble coniferous Order for De Candolle's great work.

FERDINAND MUELLER.

Botanic Gardens, Melbourne, 17*th May*, 1866.

P.S. It seems not to be generally known that all true *Frenelas* not unfrequently produce some 3-winged seeds.

Darlingia, *a New Genus of* Proteaceæ.

Among several new genera which I have recently described, is one from N.E. Australia, belonging to *Proteaceæ* and closely allied to *Knightia*, with which it has a 4-seeded carpel in common. The wings however surround the whole seed, the latter resembling those of *Cardwellia*. The latter genus has however *pendulous*, very numerous seeds, the direction of the raphe very different, and the radicle lateral. The disposition of the flowers of the new genus, on which I bestowed the name *Darlingia*, is spicate. As long as the seeds of *Knightia strobilina* remain unknown, I should not feel justified to consociate my plant with Labillardière's; and, though in *Orites* species with half-winged and entirely winged seeds exist, I prefer to keep the Australian plant distinct as a genus until further comparisons can be instituted. Meanwhile the plant has passed to some museums as *Knightia (Eucarpha) Darlingia*, and to some as *Darlingia spectatissima*. The style is deciduous, but that character is of no avail in *Grevillia*. Yours, etc.,

FERDINAND MUELLER.

February 24, 1866.

NEW PUBLICATIONS.

Le Specie dei Cotoni descritte da FILIPPO PARLATORE. Firenze: Stamperia Reale, 1866. 4to, 64 pp. (with Atlas of 6 folio plates in chromolithography.)

When Barker Webb bequeathed his magnificent library and herbarium to the fair city of Florence, he provided at the same time ample funds for keeping them up. Every botanical periodical, every new publication, and every new collection of importance was at once to be added to the accumulated treasures. Florence was at that time merely the capital of Tuscany, and the funds were vested in the Grand Duke,

who professed himself, we believe, a personal friend of Mr. Webb. As long as the old state of things continued in the peninsula all went on well; but when Italy began once more to agitate for unity and nationality, the Duke of Tuscany had to fly from the vengeance of the people. In the hurry he forgot to leave behind the funds entrusted to his honour by the illustrious Webb, and though he has had several reminders, we understand that not a penny has as yet been restored. Science, especially botanical science, has constantly to struggle with poverty; and but few of the good things of this life are reserved for her. This was felt to its full extent by men like Smithson and Webb, both of whom entrusted their wealth to foreigners, on condition that it should be used for the advancement of science, free from the deadly influence of professional jobbery. It is vexatious when the good intentions of such noble-minded men are frustrated. There is much to be said about the Smithsonian fund, but the most serious charge does probably not amount to more than errors of judgment committed by its administration. But no language can be too severe in speaking of the way in which the Duke of Tuscany has behaved about the trust confided in him, and we hope that when peaceful times have once more set in, the Italian Government will do all in its power to recover the funds left for keeping up Webb's Library and Herbarium. We felt it due to the illustrious botanist whose work is placed at the head of our article, to make this statement, because we know to what shifts he and his colleagues are put with Webb's fund suddenly cut off, and hardly any money from the Italian Government to buy the most necessary new publications. It is impossible for him to be quite familiar with what is going on in the botanical world, and many a man with less enthusiasm for science would long ere this have folded his arms and excused his absolute abstention from work till better times by the obstacles before him. Knowing all this, we have no wish to dwell upon his shortcomings any more than is necessary for the due understanding of his labours.

We do not hold *Gossypium* to be so difficult a genus as it is generally represented to be. We in northern Europe can do little towards working it up, but a botanist of average ability residing in some tropical or semitropical country could easily put it to rights. All he requires is to procure the seeds of the different species for growing in his garden. At present, when there is direct steam communication between *all* tropical and semitropical countries, this can be speedily

effected; and as soon as the various kinds flower and fruit he must figure and describe them carefully, and forward a coloured figure and description, accompanied by well-dried and complete specimens to some head-quarters of botany. Until this preliminary labour is accomplished, nothing definite can be settled about the synonymy, because our herbarium specimens are generally ill preserved—Cotton being a difficult plant to dry—and few of them have fruit and flower together. With good materials, such as those we have insisted upon, the synonymy will not present any serious difficulties.

We do not think there are more than about ten known species of *Gossypium*, all of which can be sufficiently well characterized to be readily distinguished. Parlatore describes and figures seven (besides the doubtful species); but he has overlooked *G. anomalum* (*microcarpum*), *G. drynarioides*, the finest flowering of all Cottons, and several other well-marked types contained in herbaria. He adopts all the old Linnæan species (viz. *G. herbaceum*, *arboreum*, *hirsutum*, and *religiosum*), and interprets them correctly, with the exception of *G. religiosum*. That species he takes to be what in our markets and colonies is called "Kidney Cotton;" easily distinguished from *all* other species by the seeds closely adhering to each other, instead of being free. Now, most authors regard the Kidney Cotton as *G. Peruvianum*, and restrict the name of *G. religiosum* of Linnæus, to a short-stapled tawny cotton, with loose seeds, of which the yellow dresses of the Buddhist priests are made, and which, from that connection, obtained the name of "*religiosum*." Parlatore gives to this *religiosum*, of Linnæus, the name "*G. Taitense*," and describes it from dried specimens. A full account of the plant, taken from Solander's manuscript Flora of Tahiti, has been published in Seemann's 'Flora Vitiensis.' From Solander we learn that this is one of the Cottons, the flowers of which undergo a marked change in colour between the time they open and fade, being first white then pink, a peculiarity it shares with *G. arboreum*. An allied species is *G. tomentosum*, Nutt. mss., published in 1865 in his 'Flora Vitiensis,' and now renamed, in 1866, *G. Sandvicense*, by Parlatore. It is covered with a short canescent tomentum, has yellow flowers, and also produces tawny cotton.

That Parlatore, after a conscientious study of all the *Gossypiums* available to him, should have fixed upon the Kidney Cotton as the *G. religiosum* of Linnæus, when most botanists regard one of the Nankin Cottons as *religiosum* true, may appear less strange when we state that

there is no authentic specimen of *G. religiosum* in Linnæus's herbarium, and that Linnæus's description is unsatisfactory. But there is sufficient evidence to show that Linnæus did not at all events give the name of *religiosum* to the Kidney Cotton.

We are thankful for what has been done, but hope that Professor Parlatore will not let this subject drop before he has fairly worked it out. He must dispose of all the doubtful species he has placed at the end of his book before he can regard his labours as terminated, and must furnish us with a short diagnosis of each species, besides the longer descriptions he has given.

BOTANICAL NEWS.

Dr. Seemann returned to England on the 12th ult., from his journey through Nicaragua and the Isthmus of Panama, and resumes, this month, the editorship of the 'Journal of Botany.' In the gold district of Chontales he found a number of new Palms and other fine-foliage plants, which have been placed under the care of Mr. Bull, of Chelsea. During his stay at Panama, he was able to ascend the Bayano river and familiarize himself with its vegetation, the Americans having obligingly lent him a steamer for that purpose.

In consequence of the disturbed state of the Continent, the meeting of German naturalists and physicians which was to be held at Frankfort in September next will not take place.

The Professorship of Botany at the School of Physic, Trinity College, Dublin University, is now vacant; and on Saturday, December 22, 1866, the Provost and Senior Fellows will proceed to elect a Professor of Botany. The emoluments consist of a sum of £200 paid annually by the college; of three-guinea fees paid by each person attending the Professor's three-month Clinical Lectures in Sir Patrick Dun's Hospital; and of certain other payments, to be regulated from time to time by the Provost and Senior Fellows of Trinity College. The professorship is open to Protestants of all nations, provided they shall have taken medical degrees, or shall have obtained a licence to practise from the College of Physicians, in consequence of a testimonium under the seal of Trinity College, Dublin. All persons intending to offer themselves as candidates should send in their names, the places of their education, the university at which they have taken their medical degrees, and the places at which they have practised, on or before December 14. For further particulars, candidates will have to apply to the Rev. S. Haughton, Medical Registrar of Trinity College. By the restrictions imposed, most of our best botanists are excluded from the candidature, and we therefore trust that the person chosen may be selected entirely for his merits.

We have received a copy, too late to be noticed this month, of the long-expected work of Mr. Benjamin Clarke, "New Arrangement of Phanerogamous Plants, with Especial Reference to Relative Position, including their relations

with the Cryptogamous." Only two hundred and fifty copies having been printed, botanists are advised to apply at once to Messrs. Williams and Norgate, 14, Henrietta Street, Covent Garden, London, W.C., or Robert Hardwicke, 192, Piccadilly. The price is £1.

Prof. Unger, in a paper communicated to the Imperial Academy of Sciences at Vienna, shows that Egyptian bricks contain a variety of evidence preserved, as it seems, in an imperishable form. He has examined a brick from the pyramid of Dashour, which dates from between 3400 and 3300 B.C., and found imbedded among the Nile mud or slime, chopped straw, and sand, of which it is composed, remains of vegetable and animal forms, and of the manufacturing arts, entirely unchanged. So perfectly, indeed, have they been preserved in the compact substance of the brick, that he experienced but little or no difficulty in identifying them. By this discovery Prof. Unger makes us acquainted with wild and cultivated plants which were growing in the pyramid-building days; with freshwater shells, fishes, remains of insects, and so forth, and a swarm of organic bodies, which, for the most part, are represented without alteration in Egypt at the present time. Besides two sorts of grain—wheat and barley—he found Teff (*Eragrostis Abyssinica*), the Field-pea (*Pisum arvense*), the common Flax (*Linum usitatissimum*),—the latter having, in all probability, been cultivated as an article of food, as well as for spinning. The weeds are of the familiar kinds: wild Radish (*Raphanus Raphanistrum*), Corn Chrysanthemum (*Chrysanthemum segetum*), Wartwort (*Euphorbia helioscopia*), Nettle-leaved Goosefoot (*Chenopodium murale*), bearded Hare's-ear (*Bupleurum aristatum*), and the common Vetch (*Vicia sativa*). The relics of manufacturing art consist of fragments of burnt tiles, of pottery, and a small piece of twine, spun of flax and sheep's wool, significant of the advance which civilization had made more than five thousand years ago. The presence of the chopped straw confirms the account of brickmaking as given in Exodus and by Herodotus.

The last issue of Bennett's 'Photographic Portraits of Men of Eminence' contains portraits of Mr. Charles Darwin and Dr. Berthold Seemann, accompanied by biographical sketches.

Mr. W. Cutter, of 52, Hunter Street, W.C., sends us the following melancholy news:—At p. 32 of the first volume of this Journal, there is a notice of the departure, for Old Calabar and the Cameroons, of W. Grant Milne, formerly botanist of H.M.S. Herald, Captain Denham, in the Australian seas, in which capacity he discovered many new plants, particularly in the Viti and New Hebrides groups. His friends will now learn, with the deepest sorrow, that I have just been informed by a respected missionary, that Mr. Milne has succumbed to the pernicious influence of the African climate in Creek Town, on the 3rd of May last. Having been his London agent for more than three years, I have had perhaps a better opportunity than many others to judge of the result of his labours, and I wish to bear my humble testimony to his indefatigable zeal in collecting and forwarding specimens. Besides botanical collections, he sent, from time to time, insects, shells, reptiles, etc., many of which have proved new to science, and claims for his name a respectful consideration as one of the explorers of tropical Africa."

Fig. 1

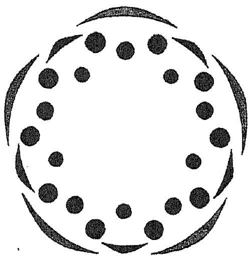


Fig. 2.

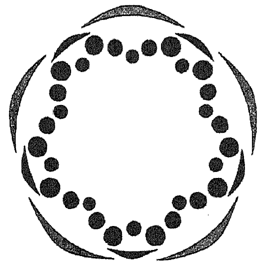


Fig. 5.

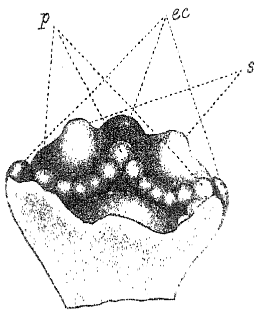


Fig. 4.

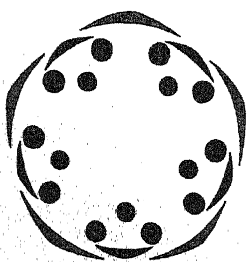
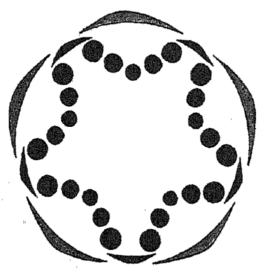


Fig. 3.



A. Dickson, M.D. del[t].

W.H.M[c] Farlane, Lith[r] Edin[r]

ON THE STAMINAL ARRANGEMENTS IN SOME SPECIES OF *POTENTILLA* AND IN *NUTTALLIA CERASIFORMIS*.

BY ALEXANDER DICKSON, M.D. EDIN.

(PLATE LII.)

On examining, about a year ago, the flowers of *Potentilla fruticosa*, I was much struck with the disposition of the stamens. These are arranged in strongly-curved lines or festoons, each containing 4 or 5 stamens, and extending from petal to petal. The convexity of each festoon is towards the centre of the flower, and there are no stamens superposed to the petals. I have since then examined the development of this andrœcium, and, as might have been anticipated from the analogy of the rosaceous developments already observed, I find that in each festoon the two stamens next the adjacent petals are the first developed; the two or three forming the middle or lower part of the festoon appearing subsequently. It is very difficult exactly to observe whether or not the central stamen of the festoon, when this consists of 5 stamens, is actually younger than those on either side of it. I have not been able with certainty to detect any decided difference of size between them; and the absence of the middle stamen at a given time does not afford any sure proof of its being a later development, as it not unfrequently never appears. Judging, however, from the analogy of the other *Rosaceæ*, it may be considered almost certain that the central stamen of the festoon is the youngest. When the stamens have all appeared, they, together with the "petals," form a pentagon of mammillæ surrounding the hemispherical termination of the floral axis. The petaline mammillæ form the angles of the pentagon, and are the oldest and largest; next in size and age are the stamens nearest the petals; and youngest and smallest are the two or three stamens in the middle of the sides of the pentagon (Plate LII. Fig. 5). I cannot but think that such an arrangement strongly confirms the doctrine of rosaceous andrœcia propounded in my paper on *Mentzelia*, etc. (Journ. of Bot. iii. p. 209); as I am unable to conceive of any possible explanation of such a festooned arrangement of stamens, unless we view the andrœcium here as consisting of five compound and confluent stamens, the terminal lobe of each such stamen being

developed as a petal, so-called. When there are five stamens in the festoon, the central stamen must be regarded as an interstaminal lobe, analogous to interpetiolar stipules—to the intersepaline lobes in some species of *Campanula*, in *Nemophila*, and in *Potentilla* itself (the so-called epicalyx), or to the interpetaline lobes of the corolla of *Soldanella*.*

I have not been able to examine any of the nearest allies of *Potentilla fruticosa*. *P. glabra* is grown in the Botanic Garden here, but has not flowered for some years. In *Potentilla rupestris*, however, I have found an andrœcium in all respects similar to that of *P. fruticosa;* and, from Lindley's description of the stamens of *P. arguta*, an ally of *P. rupestris*, as "*about* 25, *filaments inserted on the margin of a five-lobed glandular disk which surrounds the base of the receptacle*" (Bot. Reg. n. 1379), I suspect that the same arrangement occurs there also.

In connection with the foregoing investigation, I have been led to examine the staminal arrangements in a considerable number of species of *Potentilla*, in all about twenty-nine. The staminal arrangements in these species may be reduced under three heads or types.

Type I., where there are 20 stamens (16 where the flower is 4-nary): one superposed to each sepal, one to each petal, and one on either side of each petal (Plate LII. Fig. 1). This is, apparently, by far the commonest arrangement in the genus, as indeed in the whole family *Rosaceæ*.

Type II., where there are 30 stamens. Differing from the last by having three stamens, instead of one, in front of each sepal (Plate LII. Fig. 2). This occurs in the forms falling under *P. hirta* of De Candolle's 'Prodromus.'

Type III., where there are 25 stamens (arranged in five festoons, extending from petal to petal). Differing from Type II. chiefly in the absence of oppositipetalous stamens (Plate LII. Fig. 3). This occurs in *P. fruticosa*, *P. rupestris*, and probably in several others.

* The corolla of *Soldanella* presents ten lobes, alternately trifid and entire. The five trifid lobes are the petals; the five entire ones the interpetaline lobes. The petals, soon after their appearance, become connate, forming a gamopetalous corolla, with five entire lobes. Some time after this, the interpetaline lobes appear as projections of the margin of the corolla, in the centre of each interpetaline sinus; and lastly, the lateral lobes of the petals appear. The development here corresponds, of course, to a basifugal evolution of leaf-lobes, and differs in this respect from what occurs in the compound stamens of *Potentilla*, which would correspond to a basipetal one.

I have found it convenient, for the purposes of description, to employ the term *parapetalous* for those stamens which occur one on either side of each petal; *antisepalous*, for the stamen or stamens in front of each sepal; and *antipetalous* for the stamen or stamens in front of each petal.

The following is a list of the species examined by me, named and numbered according to Lehmann's 'Revisio Potentillarum' (Nov. Act. Acad. xxiii. Suppl.). In determining some of the species I have had great difficulty, which will be understood by any one who has had to do with this most troublesome genus. The names to which I have affixed the mark (?) are to be looked upon as only *approximately* correct.

No. in Revisio Potentillarum.	Species.	Type of Andrœcium.
5	P. fruticosa, *L.*	III.
11	P. ambigua, *Jacquemont*	I.
13	P. tridentata, *Sol.*	I.
15	P. bifurca, *L.*	I.
28	P. sericea, *L.* (?)	I.
43	P. stolonifera, *Lehm.*	I.
53	P. rupestris, *L.*	III.
60	P. Pennsylvanica, *L.*	I.
67	P. peduncularis, *Don*	I.
80	P. palustris, *Scopol.* (Com. palustre, *L*).	I.
84	P. chrysantha, *Trev.* (?)	I.
90	P. Taurica, *Will.* (?)	II.
91	P. recta, *L.*, β. pallida (?).	II.
92	P. hirta, *L.* (?)	II.
97	P. umbrosa, *Stev.*	I.
98	P. Nepalensis, *Hook.*	I.
103	P. Calabra, *Tenore*	I.
104	P. argentea, *L.*	I.
106	P. inclinata, *Vill.*	I.
111	P. tomentosa, *Ten.* (?)	I.
125	P. maculata, *Pourret* (P. alpestris, *Hall.*)	I.
128	P. opaca, *L.*	I.
147	P. alba, *L.*	I.
153	P. Fragariastrum, *Ehrh.*	I.
156	P. atrosanguinea, *Lodd.*	I.
158	P. elatior, *Schlecht.* (?)	I.
182	P. Tormentilla, *Sibth.*	I.
186	P. reptans, *L.*	I.
190	P. anserina, *L.*	I.

Of the species, in the foregoing list, with andrœcia falling under Type I., the following are those which exhibit a tendency to vary, either by multiplication or reduction in the number of stamens :—

A. Species exhibiting a tendency to multiplication in the number of stamens :—

P. bifurca, L. Two flowers were examined; one was normal, while in the other one of the antisepalous stamens was replaced by two slightly connected by their bases.

P. peduncularis, Don.

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.*	Antipetalous stamens.
5	10	1, 1, 1, 1, 1	1, 1, 1, 1, 1
2	10	1, 1, 1, 1, 1	1, 1, 1, 1, 2
1	10	1, 1, 1, 1, 2	1, 1, 1, 1, 1
1	10	1, 1, 1, 1, 2	1, 1, 1, 1, 2
1	10	1, 1, 2, 1, 2	1, 1, 1, 1, 2

P. Calabra, Tenore.

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
5	10	1, 1, 1, 1, 1	1, 1, 1, 1, 1
2	10	1, 1, 1, 1, 2	1, 1, 1, 1, 1
1	10	1, 1, 1, 1, 1	1, 1, 1, 1, 2
1	10	1, 1, 1, 1, 2	1, 1, 1, 1, 0
1	10	1, 1, 1, 1, 2	1, 1, 1, 1, 2
1	10	1, 1, 2, 1, 0	1, 1, 2, 1, 2

P. inclinata, Vill. (var. *subseptenata?*).

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
5	10	1, 1, 1, 1, 1	5
2	10	1, 1, 1, 1, 2	5
1	10	1, 1, ×, 1, 2	5
1	10	1, 1, 1, ×, 2	5
1	10	1, ×, 1, ×, ×	5
3	10	1, 1, 1, 2, 2	5
3	10	1, 1, 2, 2, 2	5
1	10	1, 2, 1, 2, 2	5
1	10	1, 1, 2, 1, 2	5

* In this and the succeeding tables, wherever the number of antisepalous or

The mark × indicates a partial resolution of a stamen into two, the filament bearing two anthers.

It will be seen from the above that, while *P. peduncularis* and *P. Calabra* have a tendency to vary, both in the antisepalous and antipetalous stamens, *P. inclinata* varies only in the antisepalous ones. In the last-mentioned species, it is remarkable how frequently a partial or complete resolution of an antisepalous stamen into two takes place.

B. Species exhibiting a tendency to reduction in the number of stamens :—

P. sericea, L. (?).

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
5	10	5	5
5	10	5	4
1	10	5	3

P. maculata, Pourret (*P. alpestris*, Hall.).

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
2	10	2	4
1	10	5	3
1	10	4	3
1	10	4	2
2	10	4	1
1	10	5	1

P. opaca, L. (*P. intermedia*, Nestler). Six flowers were examined; four were normal, while the other two each wanted one antipetalous stamen.

P. Fragariastrum, Ehrh. In this species a great number of flowers have the andrœcium reduced to the 10 parapetalous stamens. Of better-developed andrœcia, I have noted the following :—

antipetalous stamens is indicated by five figures, these five figures represent the number of stamens in front of the five sepals or five petals respectively, and are noted down consecutively, as they may be read off on looking round the flower.

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
2	10	5	4
1	10	5	3
1	10	5	1
3	10	5	0
2	10	4	0
1	10	2	0
1	10	1	0

P. elatior, Schlecht. (?)

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
2	10	5	5
4	10	5	3
1	10	5	2
1	10	5	0

It is to be observed that in these reductions in the number of stamens, the antipetalous evidently disappear more readily than the antisepalous ones. This is what might have been expected, as the antipetalous stamens are the younger.

Of the species falling under Type II., those which I have examined are all variable in the number of stamens; and the tendency is almost always towards a reduction in the number. In a few flowers only is a tendency to multiplication of the antipetalous stamens to be observed. I have named with some hesitation the forms occurring in the Botanic Garden; but they certainly all come under *P. hirta* of De Candolle's 'Prodromus.'

P. Taurica, Willd. (?).

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
4	10	3, 3, 3, 3, 3	5
7	10	3, 3, 3, 3, 2	5
2	10	3, 3, 3, 2, 2	5
4	10	3, 3, 2, 3, 2	5
1	10	3, 3, 2, 2, 2	5
2	10	3, 2, 3, 2, 2	5
2	10	3, 2, 2, 2, 2	5

P. hirta, L. (?)

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
1	10	3, 3, 3, 3, 3	1, 1, 1, 1, 1
3	10	3, 3, 3, 3, 2	1, 1, 1, 1, 1
2	10	3, 3, 3, 2, 2	1, 1, 1, 1, 1
1	10	3, 3, 2, 3, 2	1, 1, 1, 1, 2
1	10	3, 3, 2, 3, 1	1, 1, 1, 1, 2
1	10	3, 3, 2, 2, 2	1, 1, 1, 1, 1
1	10	3, 2, 3, 2, 2	1, 1, 1, 1, 1
5	10	3, 2, 2, 2, 2	1, 1, 1, 1, 1
1	10	3, 2, 2, 2, 2	1, 1, 1, 1, 2
3	10	2, 2, 2, 2, 2	1, 1, 1, 1, 1

P. recta, L. (?)

Number of Flowers examined.	Parapetalous stamens.	Antisepalous stamens.	Antipetalous stamens.
5	10	3, 3, 3, 3, 2	1, 1, 1, 1, 1
1	10	3, 3, 3, 3, 2	1, 1, 1, 1, 2
1	10	3, 3, 3, 2, 2	1, 1, 1, 1, 1
3	10	3, 3, 2, 2, 2	1, 1, 1, 1, 1
2	10	3, 3, 2, 2, 2	1, 1, 1, 1, 2
1	10	3, 2, 2, 3, 2	1, 1, 1, 1, 1
1	10	3, 2, 2, 2, 2	1, 1, 1, 1, 1

In both of the species which I have mentioned as exhibiting the third type of andrœcium, viz. *P. fruticosa* and *P. rupestris*, the number of stamens varies. In the festoons which the stamens form, however, *five* stamens occur with sufficient frequency to justify me in assuming 25 to be the typical number of stamens in each flower. In one flower of *P. fruticosa* I observed a stamen *superposed* to one of the petals. This deviation, which is evidently rare, is very interesting, as showing an approach to the other types.

P. fruticosa, L.

Number of flowers examined.	Number of stamens in the festoons.
2	5, 5, 5, 5, 5
2	5, 5, 5, 5, 4
3	5, 5, 4, 5, 4

Number of flowers examined.	Number of stamens in the festoons.
1	5, 5, 6, 4, 4
5*	5, 4, 5, 4, 4
2	5, 4, 4, 5, 3
3	5, 4, 4, 4, 4
1†	7, 4, 5, 4, 4

P. rupestris, L.

Number of flowers examined.	Number of stamens in the festoons.
1	5, 5, 4, 5, 4
1	5, 5, 4, 5, 3
1	5, 5, 4, 4, 4
3	5, 4, 5, 4, 4
8	5, 4, 4, 4, 4
1	4, 4, 4, 4, 4

It would be rash to speculate as to the probable value of the staminal arrangement in distributing the species of *Potentilla* into natural groups. I scarcely anticipate that it will serve as a basis for primary division of the genus, although I have little doubt that it will be found of great importance as a means of establishing, or at least limiting, minor groups. In a genus so extensive as this, my present contribution towards a knowledge of the staminal arrangements can only be viewed as a nucleus round which the results of further investigation may be aggregated. I therefore hope that any who have opportunities of examining or discovering species in the fresh state will carefully note the disposition of the stamens.

In connection with the foregoing, I would call attention to the andrœcium of *Nuttallia cerasiformis*, which, as is known, consists of only 15 stamens, viz. 10 parapetalous and 5 antipetalous (Plate LII. Fig. 4). Such an arrangement contrasts most interestingly with the types I have described. Thus, in *Nuttallia* there are no antisepalous stamens; in *P. fruticosa*, etc., there are no antipetalous stamens; while in *P. anserina*, etc., there are both antisepalous and antipetalous stamens.

* In one of these five flowers a stamen occurred superposed to one of the petals, in addition to those in the festoons.

† The tip of the sepal to which the festoon with seven stamens was superposed was bifid.

Adopting my theory of rosaceous andrœcia, there is no confluence of the lobes of the compound stamens in *Nuttallia*, *i.e.* there are no interstaminal lobes.

In conclusion, I must express my obligations to Mr. M'Nab, for his having kindly permitted me to make what use I required of the collection of *Potentillas* in the Botanic Garden, from which I obtained the greater number of the species which I examined.

Explanation of Plate LII.

In the diagrams the sepals are shaded. The so-called petals (apices of the compound stamens) are represented in black. The stamens are represented by black spots; their relative ages (determined by observation of development or by analogy) being indicated by the size of the spots,—the larger representing the older, the smaller the younger stamens. Fig. 1. Diagram representing the staminal arrangement in species of *Potentilla* falling under type I. This figure is reproduced from my paper on the andrœcium of *Mentzelia*, etc. The antipetalous stamens are represented as the most internal; but in many *Potentillas* (in the adult state, at least) they appear to be external to the antisepalous stamens. 2. Diagram of arrangement in species of *Potentilla* falling under type II. 3. Diagram of arrangement in species of *Potentilla* falling under type III. 4. Diagram of arrangement in *Nuttallia cerasiformis*. 5. Portions of young flower of *Potentilla fruticosa*; *ec*, parts of epicalyx; *s*, sepals; *p*, petals so-called. Between the petals festoons of staminal mammillæ extend. Of the two festoons represented, one contains five, the other four stamens.

ON THE POLLEN-GRAINS OF CERTAIN RANUNCULEÆ AND OF *LOTUS CORNICULATUS* AND *L. MAJOR*.

By George Gulliver, Esq., F.R.S.

Though the importance of the forms and structure of the elementary parts of plants has long been recognized in the grouping of the great divisions of Phanerogams, but very little aid has yet been derived from histology or microscopic research in the discrimination of near allies of this class. And no wonder, after Schleiden had concluded that a further advancement of systematic botany could hardly be expected from mere anatomy and physiology; and when, indeed, we see how much the cells and other parts of the intimate structure of the members of the same and connatural orders are alike, while the differences are comparatively few and not discoverable without many exact comparative examinations. Still, after such observations have been sufficiently extended, we shall surely acquire a valuable addition to our

stock of truly natural characters to assist us in the definition of the differences between several kindred species or orders of the vegetable kingdom.

In this point of view, I have already shown the importance of the structure and function—form, size, and contents—of the elementary or other cells. And such is often the excellence of this kind of character that by it alone, without any other whatever, a mere shapeless and minute fragment of a plant, at any period of its growth, may be most easily and certainly distinguished, sometimes from any other species of its genus and frequently from every other nearly allied Order. Nay, by this very character simply, a plant may be tried and found wanting in a close or true affinity with the Order under which it has been placed by systematic botanists. On these points, descriptions and references will be found in my contributions to the 'Popular Science Review,' October, 1865, and 'Quarterly Journal of Microscopical Science,' January, 1866.

As to the real worth of the pollen for ordinal or generic characters, it will probably rise higher when the facts have been more completely ascertained and compared. At present, they have not been sufficiently studied; and so manifold are they, and so vast is this single field of observation, that a long time may pass before they can be fully realized and reduced to a comprehensive and useful method.

Meantime, I hope to excite more attention to the subject by showing that even closely allied plants may present a sufficient difference in their pollen for specific diagnosis. Since my notice of the pollen of *Ranunculus arvensis* (Ann. Nat. Hist., July, 1865), I have made numberless comparative examinations of the pollen of the yellow-flowered divided-leaved British Crowfoots; and, as the results have been always constant and certain, a woodcut is now given of the outlines of the pollen-grains of two species which stand close together in Professor Babington's 'Manual of British Botany.' It will thus be seen how the pollen-grains of *Ranunculus arvensis* differ, in their roughness and much larger size, from those of *Ranunculus hirsutus*; and the pollen of *R. arvensis* differs similarly from that of the other species of the section just mentioned.

But it is surprising to find that there is a regular difference of size between the pollen-grains of *Lotus corniculatus* and *L. major*, plants so very closely related that the latter is considered by some eminent

botanists as a mere variety of the former. Indeed, *L. major* has been described, on high authority, as only a "larger development in all its parts, from its moister habitat," of *L. corniculatus*.

Now, however, I am to show that the pollen-grains of *Lotus major* are uniformly smaller than those of *L. corniculatus*. In my note-book many measurements, made in several different months and years, are entered of the pollen-grains of these plants; and although the absolute size of these grains in one or other of the two plants often appears to have differed slightly, the relative size has always been plainly distinct. In every case the larger size of the pollen-grains of *Lotus corniculatus* was obvious. Hence I have frequently repeated the measurements during this summer; and, as the results are still uniform, this notice is drawn up, with a woodcut, for the 'Journal of Botany.'

In the following woodcut, of the mere outlines, all the objects are done to the same scale of $\frac{1}{1000}$ths of an English inch; and the measurements are given in vulgar fractions of that inch.

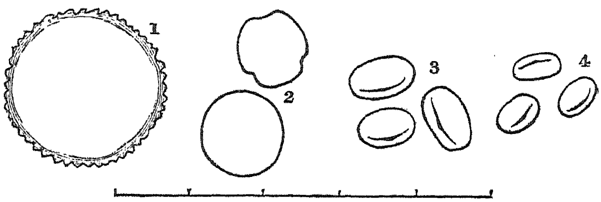


Fig. 1. The pollen-grain of *Ranunculus arvensis*, large and rough on the surface. Diameter $\frac{1}{470}$ of an inch.

Fig. 2. The pollen-grains of *Ranunculus hirsutus*, much smaller and smoother than the preceding. Diameter about $\frac{1}{840}$ of an inch.

Fig. 3. Pollen-grains of *Lotus corniculatus;* long diameter $\frac{1}{1143}$, short diameter $\frac{1}{1714}$ of an inch.

Fig. 4. Pollen-grains of *Lotus major;* long diameter $\frac{1}{1600}$, short diameter $\frac{1}{2666}$ of an inch.

While noticing that this is only a difference of size between the pollen-grains of *Lotus corniculatus* and *L. major*, it may be granted that this fact, from its constancy, must have some significance; and it is really here the most certain single difference between these two plants. And just so is the difference of size between the tissue-cells of *Hymenophyl-*

lum Wilsoni and *H. Tunbridgense*, as depicted by me in the 'Journal of Botany,' October, 1863. But, besides their greater size, the pollen-grains of *Ranunculus arvensis* differ in their remarkable roughness from those of its close allies. And whoever will compare the small, smooth, oval or coffee-shaped pollen-grains of *Ranunculus Ficaria* and *Caltha palustris*, with the round ones of the above-mentioned subsection of *Ranunculeæ*, may see differences quite as curious.

Finally, as these observations were almost all made on plants in this neighbourhood, I hope that other botanists may be induced to extend the inquiry to species of different districts and countries.

Edenbridge, Kent, Aug. 9, 1866.

SOME REMARKS ON THE POISONOUS PROPERTIES OF *EUPHORBIA CARACASANA*, *Boiss.*

BY A. ERNST, ESQ., OF CARACAS.

Euphorbia Caracasana, Boiss. (De Cand. Prod. xvi. p. 60. n. 215), is one of the typical plants of the valley of Caracas. Its vernacular name is *Lechero*, *i.e.* milk-yielding, on account of the abundant milky juice it contains. The description given in the 'Prodromus' is exact in nearly all points, except that the leaves are sometimes much larger than stated by Boissier, and the plant does not always remain shrubby.

On the 24th of June, my friend Mr. Nichols and myself found in the valley of the Catuche (the river which supplies Caracas with water) several specimens which had attained the form of sturdy trees, the stem of one being no less than ten inches thick, and so high that I was unable to distinguish the different leaves. I should not have taken it for the *E. Caracasana*, but for some smaller specimens in the neighbourhood, the leaves of which (no flowers being found) left no doubt whatever about the species.

On the bark being cut, the milk ran down in such abundance that in a short time six ounces of it were collected. It is of cream-colour, has a rather balsamic odour, and an insipid taste. I put only two drops on my tongue. About a quarter of an hour afterwards I felt an intense burning in the throat, which, even by frequent garglings with

cold river-water, could not be relieved. At the same time I felt severe pain in the stomach, and during half an hour vomited no less than five times. Having meanwhile returned to town, I took an ounce of olive oil, and experienced no further inconvenience.

But I was destined to discover another poisonous quality of this milk. Having washed my hands, I had not been careful enough in cleaning and drying out the washing-basin, so that some of the milk remained in it in a diluted state, and when afterwards I washed my face, it entered my eyes and occasioned a most painful inflammation, which, however, disappeared in the course of the same day after constant bathing them with sugar-water. The milk had no caustic influence on my skin. Mr. Nichols was affected by the same small quantity of poison in a very different manner, as will be seen from his letter :—

"When discovering what at first I took to be the *Palo de Vaca* (or Cow-tree) of Venezuela, but which eventually proved the *Euphorbia Caracasana*, I tasted the milky juice, *but at that time felt no ill effects from it.* I afterwards concluded that its action was not only different on individuals, but that it was influenced by the amount of food in the stomach.

"*The first morning I tasted it I had breakfasted, but the second visit (when accompanied by Mr. Ernst) was at daybreak, some hours before that meal.*

"Soon after we had 'tapped' the tree, I experienced a very annoying sensation of itching on the eyelids, resulting in painful inflammation, which considerably increased towards night, or at all events when the eyes remained closed. I attributed this to the atmosphere, which must have been impregnated with the poison, as during the process of collecting and examining the fluid we were necessarily sufficiently close to inhale it. It was not until some forty-eight hours after this that I was to feel the real effects of it. I was then taken with violent purging pains, sometimes sudden and acute, whilst at others it was prolonged. It was but a momentary relief when nature had its way, the pain commenced immediately after each operation. I may well assert that I never before suffered so much internal pain, which lasted, more or less, twelve hours. I was quite prostrated, caring only to lie down, and it was fully a week before the final effects wore off."

These involuntary experiences led me to a more exact inquiry into the chemical and toxicological properties of the milk. Part of the contents of the bottle in which I had brought it from the mountains had coagulated, forming a fibrous cheese-like body, floating in the liquid residue. The specific weight of the milk is 0·97 ; it boiled at the same temperature as water. Under the microscope I saw in it

numerous small round grains, which I suppose to be caoutchouc. The milk does not harden when exposed to the air, but forms a sticky yellow substance, easily dissolved by fat oils. Cold alcohol yielded an extract containing a small quantity of resinous matter; hot alcohol yielded a larger quantity (of the same resin or of a different one?). Sulphuric and muriatic acid produced a separation of the milk into a light yellow transparent liquid, and a white fibrous sediment. The latter boiled with water gave some fatty substance (wax?) floating on the surface of the water. After twenty-four hours the milk turned sour.

In order to study as far as possible the poisonous qualities of the milk, I experimented on two guinea-pigs and one rabbit.

The first guinea-pig received 5 grammes of the milk; soon after the animal vomited twice, and recovered completely. The second guinea-pig swallowed 10 grammes; it kept on vomiting nearly for 3 hours, and then died. The rabbit had 20 grammes; the poison acted very energetically both as an emetic and purge, and the animal died in less than half an hour. I was unable to ascertain the exact time of the death, as business called me away. The rectum of the two animals showed a considerable number of red spots; other changes in the intestines could not be discovered.

Not being experienced in toxicological matters, I give my observations such as they were. But there is no doubt that the milk of *Euphorbia Caracasana* is a strong drastic acrid poison, and probably more so when the plant has attained a greater development. It contains, it would seem, no volatile oil, and acts differently on different constitutions, but is equally deleterious to man and animal. The leaves of our plant are never touched by any animal, and I do not remember having seen any insect feeding upon them. Dr. Masters ('The Treasury of Botany,' i. 477) says, that in Brazil the juice of *E. cotinifolia*, L., is employed by the natives for poisoning their arrows; the same might be effected by the juice of *E. Caracasana*, Boiss., a plant long confounded with the just-mentioned Linnean species, nearly related to it, and belonging to Boissier's section *Alectoroctonum*.

UNRECORDED STATIONS, MOSTLY NEAR PLYMOUTH, OF SOME UNCOMMON PLANTS, ETC.

By T. R. Archer Briggs, Esq.

Helleborus viridis, L.—This is probably nowhere indigenous in the neighbourhood of Plymouth, but grows rather plentifully in an orchard near Elburton, and occurs in another between that place and Saltram.

Berberis vulgaris, L.—Very uncommon near Plymouth, but apparently wild at Blaxton, near Tamerton Foliott, where it forms a small thicket in a waste wooded spot by the road leading to the mills.

Barbarea intermedia, Bor.—This threatens to become a troublesome weed. It appeared again last spring at Common Wood in arable land, from which locality I recorded it last year, and grew also in a clover field near Thornbury; by the side of a road, and about a quarry near King's Tamerton, a few miles from Plymouth, as well as on a railway bank between that town and Saltash.

Viola permixta, Jord.—To the station for this plant given, on my authority, in the Thirsk Club Report for 1864, may be added a lane near Elburton, another near Harestone, and one bounding Saltram Grounds. At all these places plants of *V. odorata* grow near it, and the district produces *V. hirta* in profusion.

Sagina apetala, L.—As but little is known respecting the relative distribution of this species and *Sagina ciliata*, Fries, I give the following list of stations for this common species:—On walls about and in Plymouth; in its neighbourhood at Compton Gifford; Knackersknowle; on Radford Quay; on a wall near the coast between Bovisand and Wembury; by the side of an old road near Billacombe; on a wall near Longbridge; in a dry waste spot at Cann Quarry; on the Devonshire side of the Tamer opposite Saltash, growing with *S. ciliata*. In Cornwall—on a wall about two miles from Saltash by the road to Moditonham, growing with *S. ciliata;* on walls at Saltash, Torpoint, and St. John's; at Truro, Penzance, near the Logan Rock, and St. Just.

Sagina ciliata, Fries.—In a waste spot between Fordbrook and Wembury; in great abundance in dry open spots on the coast between Bovisand and Wembury; at King's Tamerton; at Cann Quarry, where *S. apetala* and *subulata* grow also; in a waste spot between Bickleigh and Colebrook; by the roadside between Blaxton and Horrabridge; in a waste by the Plymouth and Tavistock road near Fancy,

and by the tram-road at Fancy Wood; in a dry spot by the Tamer opposite Saltash. In Cornwall—on a wall about two miles from Saltash; at Rame Head on the slope above the rocks, plentifully; near Truro, by the side of the Redruth road, and between Helston and the Lizard.

Lepigonum rupicola, Lebel.—Dartmouth; on low rocks by the side of the Tavy (tidal river) at Beer Ferris, Devon. Falmouth; Cape Cornwall. This seems to be very common on rocks by the southern coasts of Devon and Cornwall.

Hypericum undulatum, Schousb.—By a stream about three miles from Truro, beyond Kenwyn; very sparingly in a marsh by the coast about a mile from Falmouth; plentifully in a valley near Porthcurnow, about three miles from Land's End, and also in a moist spot by the roadside, a little nearer the latter place.

Geranium phæum, L.—Naturalized on a bank near a farm between Lee Mill Bridge and Slade, Devon.

Trigonella ornithopodioides, De Cand.—Rather common near Plymouth in dry waste spots not far from salt water, where the soil is not of a sufficient depth to nourish a vegetation luxuriant enough to overcome this small species: more rare in inland situations, but to be found on top of a rubble heap at Cann Quarry in the Plym valley.

Lotus angustissimus, L.—At Rame Head, and on slopes above the cliffs at Whitsand Bay, Cornwall, June 1866.

Lotus hispidus, Desf.—With the former at Rame Head. In tolerable abundance in the dry pasture near Wembury, where I found it very sparingly last year, June, 1866.

Agrimonia odorata, Mill.—Plentiful in a hilly orchard near Stoneybridge, Egg Buckland, intermixed with *A. Eupatoria*, but more abundant than that species. Sparingly near Leigham and Estover in the same parish. Several plants on a bank in a lane leading from Sparkwell towards Yealmpton, and a few on a hedge-bank between Ridgeway and Lee Mill Bridge.

Rosa tomentosa, Woods.—This seems to occur throughout Cornwall, for last season I collected it in the north and west of that county (*vide* Thirsk Club Rep. in Seem. Journ. of Bot. 1865, p. 75), and have this season gathered it between Helston and Lizard Point, and at Mullion.

Rosa micrantha, Sm.—About Truro, Perran, Falmouth, and in a

valley between Helston and the Lizard, Cornwall. Dartmouth. About Plymouth this is very common; and at Bircham, Allowpit, near Stoneybridge, at Pennycross, near King's Tamerton, and at Pomphleet—places all within a few miles of that town, a variety with naked peduncles occurs.

Rosa rubiginosa, L.—Very rare about Plymouth. At Cornwood, and in a wood near Riverford, Plym Valley.

Rosa collina, Jacq.—Near Launceston, and about Truro and Perran, Cornwall.

Pyrus Scandica, Bab.—In hedgerows near Roborough, about six miles from Plymouth, where one or two bushes flowered last spring. Mr. Syme has pronounced it to be *Scandica*.

Epilobium angustifolium, L.—By the South Devon Railway, close to a wood near Chaddlewood, away from houses, and the plant the wild form *macrocarpum*, Steph.; but it could not have grown here before the line of railway was formed, about twenty years ago, as the habitat is below a "cutting." I have not seen it elsewhere near Plymouth.

Polycarpon tetraphyllum, L.—Abundant in a dry waste spot under a wall at King's Tamerton, Devon, May, 1866.

Tillæa muscosa, L.—I recorded this some years ago from Colwell Quarry, on the right bank of the Plym, and have since found that it grows very abundantly in dry waste spots about Cann Slate Quarry, on the opposite side of that river, as well as less plentifully by a footpath between that place and Plym Bridge, and very sparingly in one or two dry open spots in the wood above the quarry.

Pimpinella magna, L.—The profusion of this species in many places near Plymouth seems worthy of notice. Orchards and moist hedgebanks in Egg Buckland Parish, and elsewhere within five miles of Plymouth, north and east, are so full of it that literally cartloads might be collected in July and August.

Myrrhis odorata, Scop.—A single plant by the Dart near Buckland-in-the-Moor, June 7, 1866.

Sambucus Ebulus, L.—Very rare near Plymouth. In a waste spot near a cottage at Cann, where it may not be truly wild.

Fedia auricula, De Cand.—Not uncommon in arable land in many places near Plymouth, but less general than *F. dentata*.

Antennaria dioica, Gært.—On Roborough Down, to the right of the road leading from the Plymouth and Tavistock road to Buckland

Monachorum. Previously recorded from another part of this extensive common.

Cuscuta Trifolii, Bab.—This has appeared rather plentifully this season in clover-fields on Fursdon estate, Egg Buckland, also at Coldridge in the same parish, and in a clover-field at Compton Gifford. It seems to be quite a recent introduction at these places.

Orobanche minor, Sutt.—A very rare species near Plymouth, if *amethystea* be distinct. On *Trifolium pratense* in a field at Fursdon, where the *Cuscuta Trifolii* occurred, July, 1866.

Mentha piperita, β, Smith; *vulgaris*, Sole, t. 8.—On a sand-bank by the Plym, near Plym bridge. Pronounced to be this by Mr. J. G. Baker.

Centunculus minimus, L.—By damp road-sides, between Launceston and Bude, Cornwall.

Rumex sanguineus, L.—A few specimens of the typical plant on hedge-banks on both sides of the road between Plymouth and Mile-house.

Orchis Morio, L.—Very rare near Plymouth, growing only, so far as I am aware, in a bushy spot on limestone, and in an adjoining old pasture near Elburton, Devon.

Habenaria bifolia, Br.—Viverdon Down, near Callington, Cornwall.

Narcissus poeticus, L.—The very generally cultivated double-flowered variety of this *Narcissus* grows in two orchards at Bickleigh: in profusion in one of them. The single-flowered plant is not common, even in gardens in the neighbourhood of Plymouth, and does not, like *N. biflorus*, occur in orchards as a doubtfully indigenous species.

Allium oleraceum, L.—Since I recorded this, last year, as a Devon plant, from my having found it near Plymstock, I have discovered it in many spots on limestone, growing in bushy places on the borders of fields, and in earth on tops of old walls, in the tract of country lying between Pomphleet, Plymstock, Elburton, and Plympton, as well as on a wall near Oreston.

10, *Torrington Place, Plymouth, August* 17, 1866.

ADDITIONAL NOTES ON ANADYOMENE AND MICRODICTYON, WITH INDICATIONS OF A NEW GENUS MACRODICTYON (*Conf. Journ. of Bot.* 1866, *pp.* 41, 65.)

BY DR. J. E. GRAY, F.R.S., ETC.

My excellent friend, the veteran botanist, M. Lenormand, of Vire, in Normandy, has with his usual kindness sent me all his collection of specimens of *Anadyomene* and *Microdictyon* for examination. They are interesting as showing the geographical distribution of the species, and as containing a new form of Netted Confervaceæ, which I propose to call *Macrodictyon.*

Anadyomene stellata. HAB. Coast of France, Fréjus, *M. Gérandy*, 1861; Cannes, *M. Chauvin*, 1839. Shores of the Adriatic (determined by *M. Kützing*, 1849). Nizza. Spalato.

Var. *Floridana?* Key West, *M. Bailey*, 1849; Baia de Bahama, *M. Chauvin*, 1825; Bahia, *M. Moricand*, 1848, examined by *M. Agardh* 1845 ("*Anad. plicata?*"); Island of Guadaloupe, *M. Duchassaing*, 1853.

Var. or allied species with the main branches elongated, forked and trifid. HAB. Canaries, *M. J. M. Despréaux*, 1840.

Anadyomene (Stenocistus) Lenormandii; frond coriaceous, wedge-shaped, imbricate, radiating from a common base, the midrib prominent on the underside near the base; the lower joint linear, several times longer than broad, with radiating group of 2–3 or rarely 4 cylindrical branches at the tip; the apical cells shorter; interspaces between the main cell wide, filled with minute cells. HAB. Isle of Celebes, *Cab. M. Lenormand*, Vire. A larger, coarser plant than *A. Wrightii.*

Microdictyon Velleyanum. HAB. New Caledonia; Port Jackson, *Harvey*. The plant increases in size by the extension of the main filament, which gives out an oblong cell on each side of each articulation; these cells elongate, and at length coalesce with cells from other branches and form a network; the development is somewhat like that shown in Dr. Harvey's plate of *Struvea plumosa*, Phyc. Austral. t. 32, but the genus differs entirely from *Struvea*, and having no one-celled central midrib, which is the original of all the frond.

Microdictyon tenue, Gray. HAB. Red Sea. There is a specimen of this species from the Red Sea in M. Lenormand's herbarium, which

he received from M. Decaisne in 1841. It is very like the other species in outward appearance. It is pale brownish-white when dry. The specimen does not show any indication of the imbricate base as described by Decaisne, but it is not in a very good state, not being well dried. It is inscribed "*Microdictyon Agardhianum*, Dec.," and the second label adds Kz. Sp. p. 512. n. 1.

MACRODICTYON.

Frond expanded, netted, uniform, without any main filament, entirely formed of uniform small elongated joints united so as to form a network, the sides of the mesh being each formed of a single joint; chlorophyll glandular. It differs from *Microdictyon* in having no main filament from which the other arises. This marine *Conferva* is like a large-jointed *Hydrodictyon*, but the frond is expanded, and not forming a tube. The frond is extended by the new joint springing out at the junction of two cells, which is elongated into a branch of oblong joints giving out two large oblong cells, one on each side of each articulation; these no doubt at length united to other cells, and forming a network.

Macrodictyon clathratum.—*Microdictyon clathratum*, Martens. *Microdictyon Velleyanum*, Turner in Herb. Lenormand. HAB. Sumatra, Pulo Tikus, *Martens;* Sandwich Islands, *M. Edu. Jardine*, 1855. The development of the cells is like that of *Struvea plumosa*, as figured by Harvey, Phyc. Austral. t. 32. It differs from *Struvea* in not having any central continued midrib or stem, and therefore appears more allied to *Confervaceæ* than *Valoniaceæ*. The genus wants further examination, but I do not feel myself at liberty to wet M. Lenormand's single specimens mounted on talc.

There is a second specimen forming a large mass roughly dried, which appears to be the same plant. It is inscribed *Microdictyon Velleyanum*, Decaisne, *forma juven.?* Sandwich Islands, *M. Edu. Jardine*, 1855, n. 218. The cells are the same size and form, and the whole plant very different from any species of *Microdictyon*. The mesh is much larger, the cells several times thicker and longer, and with the green granules well developed and of a larger size. The plant is also growing on a *Rhodosperm* with a stichidia like a *Dasya* or *Polysiphonia*, but the fragments on the specimen only show the stichidia. I cannot see any appreciable difference between the specimen from

Sumatra and the Sandwich Islands, even under the microscope. The cells on the young branches resemble the cells of *Cladophora valonioides*, Harvey, Phyc. Austral. t. 78; the cells of the younger part are rather longer for their width.

REVISION OF THE NATURAL ORDER *HEDERACEÆ*.

BY BERTHOLD SEEMANN, PH.D., F.L.S.

(*Continued from Vol. III. p.* 363.)

X. ON THE GENERA WITH ARTICULATED PEDICELS AND DIMEROUS OVARY.

There are only three genera which come under this heading, *Sciadopanax*, *Macropanax*, and *Nothopanax*, the two former of which have already been treated upon; and they differ by the following characters:—

XVII. SCIADOPANAX. Stigmata 2, stylopodio conico imposita. Albumen ruminatum.—Arbor Madagascariensis; foliis imparipinnatis.

XI. MACROPANAX. Stylus 1, elongatus. Albumen æquabile.—Frutices Indiæ orientalis; foliis digitatis.

XXVIII. NOTHOPANAX. Styli 2–3, elongati, distincti. Albumen æquabile.—Arbores v. frutices Asiæ, Africæ, et Australiæ; foliis simplicibus v. pinnatim digitatimve compositis.

XXVIII. NOTHOPANAX, Miq. in Bonplandia, 1859, p. 139, et Fl. Ned. Ind. vol. i. pars i. p. 765. Pedicelli articulati. Flores calyculati, polygami. Calycis tubus obconicus; limbus minute 5-dentatus. Petala 5, æstivatione valvata. Stamina 5. Styli 2 (per excessum 3), dein divergentes, fere ad basin usque facie interiore stigmatosi. Ovarium 2-, rarissime 3-loculare. Drupa didymo-compressa v. rarissime 3-gona. Albumen æquabile.—Frutices sæpius anisati; foliis decompositis, pinnatis digitatis v. simplicibus; petiolis basi stipulatim dilatatis; umbellis decompositis v. racemoso-paniculatis, floribus parvis albidis v. viridiusculis.—*Panacis*, *Araliæ*, et *Paratropiæ* sp. auct.

Nothopanax was established in 1856 by Miquel in the 'Bonplandia' for a set of shrubby *Hederaceæ* having articulate pedicels, polygamous 5-androus flowers, and a two-celled ovary. The generic character there

given was admitted by him, unaltered, in his 'Flora of Dutch India;' but in the Supplement of that work he amplified it so far as to admit a Hederacea with 5–7 styles, which he named *N. tricochleatum*. In another more recent publication (Ann. Mus. Lugd. Bat. vol. i.), he rejects the genus altogether, and refers all the species once more to the old Linnæan genus *Panax*. I think *Nothopanax* ought to be upheld, and be restricted to the dicarpous (by excess tricarpous) species. The 5-carpous plant Miquel referred to it I consider to *Polyscias pinnata*, Forster. With *Panax*, as I understand the genus, *Nothopanax* has but distant relationship. The genus now comprises twenty-one species, but it is quite possible that some of them will have to be rejected when better specimens can be examined. I more than half suspect that *N. (?) obtusum*, of which I have not seen a specimen, may belong to my new genus *Heteropanax*, which is founded upon the East Indian *Panax fragrans*, Roxb. What I have seen in herbaria under the name of *Panax pinnatum*, Lam., is certainly a species of *Arthrophyllum*, a genus easily known by its 1-celled ovary; and Miquel's description of "*Panax pinnatum*," given in the Annales above quoted, must refer to a different plant, perhaps a genuine *Nothopanax*. I have also my suspicion about *N. cochleatum* (known to me only from books). It has simple leaves, whilst all the other species of the genus have compound ones. Most of the species have a very strong smell of aniseed and celery,—hence the name of "Celery-tree" is given to *N. elegans*, Seem., by the Queensland colonists.

* *Folia decomposite tripinnata.*

1. *N. fruticosum*, Miq. in Bonpl. 1856, p. 139; Fl. Ned. Ind. l. c. p. 765.—*Panax fruticosum*, Linn. Spec. p. 1515; Wight, Icon. t. 573. *Scutellaria tertia*, Rumph. Amb. vol. iv. p. 78. t. 33.—Indian Archipelago (Horsfield!), Cochinchina (Loureiro! in Brit. Mus.), Ceylon (Seemann!), Wallis Island (Sir E. Home!), Viti Islands (Seemann! n. 204). Much cultivated about houses by all Malayan and Polynesian races.

2. *N. (?) obtusum*, Miq. in Bonpl. 1856, p. 139; Fl. Ned. Ind. l. c. p. 166.—*Panax obtusum*, Bl. Bijdr. p. 890; Miq. Ann. Lugd. Bat. vol. i. p. 15.—Western Java (Blume!). Perhaps a species of *Heteropanax*.

3. *N. elegans*, Seem. Fl. Vit. p. 114.—*Panax elegans*, Fraser, mss.;

Muell. Fragm. vol. ii. p. 107, et in Trans. Phil. Soc. Victoria, 1857. *Panax polybotrys*, F. Muell. Herb. *Panax decompositum*, Muell. Herb. —"Celery-tree" of Moreton Bay. Island and shores of Moreton Bay (A. Cunningham! F. Mueller!).

** *Folia simpliciter pinnata.*

4. *N. Cumingii*, Seem. l. c.—*Paratropia Cumingiana*, Presl, Epim. p. 250; Walp. Ann. vol. ii. p. 725.—Philippine Islands (Cuming! n. 1553), Borneo (Motley! in Herb. Hook.).

5. *N. multijugum*, Seem. Fl. Vitiens. p. 115, t. 18 et 19.—*Paratropia (?) multijuga*, A. Gray, Bot. Wilkes, p. 722.—Viti (Seemann! n. 205; Harvey! U. S. Expl. Exped.).

6. *N. Macgillivrayi*, Seem. Fl. Vitiens. l. c.—*Panax Macgillivrayi*, Benth. Fl. Austr. iii. ined. Cape York, Australia (M'Gillivray!)

7. *N. Murrayi*, Seem. l. c.—*Panax Murrayi*, F. Muell. Fragm. vol. ii. p. 106.—New South Wales (Oldfield! in Herb. Hook.).

8. *N. molle*, Seem.—*Panax mollis*, Benth. Fl. Austr. iii. p. 382 (ined.).—Rockingham Bay (Dallachy!).

9. *N. (?) Anisum*, Miq. in Bonplandia, 1856, p. 139, et Fl. Ned. Ind. l. c. p. 766.—*Panax Anisum*, De Cand. Prodr. vol. iv. p. 254. *Anisum Moluccanum*, Rump. Amb. vol. ii. p. 132, t. 42.—Moluccas (Rumphius!). Known only from Rumphius's figure and description.

10. *N. sambucifolium*, C. Koch, Wochenschrift, 1859, p. 77.—*Panax sambucifolium*, Sieb. in De Cand. Prodr. vol. iv. p. 255. *P. margaritifera*, Visiani (ubi ?), teste C. Koch, Wochenschrift, 1859, p. 370. *Panax dendroides*, F. Muell. Fragm. vol. ii. p. 107. *Trachymene pinnata*, Cunn. in Herb. Hook.—East Coast of New Holland (Sieber! n. 256; A. Cunningham! Beckler!), Victoria and Australia Felix (F. Mueller!). Varies with narrow and broad leaves, Mueller's *P. dendroides* and *angustifolium* representing the narrow-leaved forms.

11. *N. Zippelianum*, Seem. Fl. Vit. p. 115.—*P. Zippelianum*, Miq. Ann. Lugd. Bat. vol. i. p. 15.—New Guinea (Zippelius!).

12. *N. Samoense*, Seem. Fl. Vit. l. c.—*Panax Samoense*, A. Gray, Bot. Wilkes, p. 717.—Samoan Islands (U. S. Expl. Exped.! Powell!).

13. *N. farinosum*, Seem. mss.—*Aralia farinosa*, Delil. mss., in Ferret et Galinier, Voy. en Abyss. iii. p. 135, n. 72; Walp. Ann. ii. p. 724. *Panax pinnatum*, A. Rich. Tent. Fl. Abyss. i. p. 335; Walp. Ann. ii. p. 723. *Aralia pinnata*, Hochst. Plant. Exsic.—Abyssinia (Hochstetter!).

*** *Folia digitata.*

14. *N. simplex*, Seem.—*Panax simplex*, Forst. Prodr. n. 399, et Icon. (ined.) t. 287; De Cand. Prodr. iv. p. 253; A. Rich. Fil. t. 31; Hook. Fl. Ant. i. p. 18, t. 12; Fl. N. Zel. i. 93, et Handb. p. 100.—Auckland Islands (Hooker!), New Zealand (Forster! Bidwill! Colenso!).

15. *N. anomalum*, Seem.—*Panax anomalum*, Hook. Lond. Journ. Bot. ii. p. 422, t. 13; Fl. N. Zel. i. p. 93, et Handb. p. 101.—Northern and Middle Islands of New Zealand (Nelson! Bidwill!).

16. *N. Colensoi*, Seem.—*Panax Colensoi*, Hook. fil. Fl. N. Zel. i. p. 94, t. 21.—"Ivy-tree" of Otago. Middle and Southern Islands of New Zealand (Colenso! Lindsay! Hector!, etc.).

17. *N. cephalobotrys*, Seem.—*Panax cephalobotrys*, F. Müll. Fragm. ii. p. 83.—On the Richmond River, New Holland (Beckler!)

18. *N. arboreum*, Seem.—*Panax arboreum*, Forst. Prodr. n. 398, et Icon. (ined.) t. 286; De Cand. Prodr. iv. p. 253; Endl. in Ann. Wien. Mus. i. p. 187, t. 15; Hook. Lond. Journ. Bot. ii. p. 421, t. 11; Hook. fil. Fl. N. Zel. i. p. 24, et Handb. p. 102.—New Zealand (Forster! Banks and Solander! etc.), Kermadec group (M'Gillivray!). Cultivated in Europe.

19. *N. Sinclairi*, Seem.—*Panax Sinclairi*, Hook. fil. Handb. Fl. N. Zeal. p. 103—Northern Island of New Zealand (Colenso! Sinclair!).

20. *N. Gunnii*, Seem.—*Panax Gunnii*, Hook. fil. in Lond. Journ. Bot. vi. p. 466, et Fl. Tasm. i. p. 163, t. 37.—Van Diemen's Land (Gunn! Milligan!).

**** *Folia simplicia.*

21. *N. cochleatum*, Miq. in Bonplandia, 1856, p. 139, et Fl. Ned. Ind. l. c. p. 766.—*Aralia cochleata*, Lam. Dict. vol. i. p. 224. *Panax cochleatum*, De Cand. Prod. iv. p. 255. *Panax scutellarioides*, Rein. in Blume, Bijdr. p. 888. *Panax conchifolium*, Roxb. Fl. Ind. vol. ii. p. 77. *Scutellaria prima*, Rumph. Amb. vol. iv. p. 75, t. 31.—Indian Archipelago.

Species exclusæ.

N. (?) pinnatum, Miq.=*Arthrophyllum*, sp.

N. tricochleatum, Miq.=*Polyscias pinnata*, Forst.

XI. On the Genera with Inarticulate Pedicels, Dimerous Ovary, and Ruminate Albumen.

Under this heading belong *Heteropanax* and *Cussonia*, differing in the following absolute characters:—

XXIX. *Heteropanax.* Styli 2, liberi, demum divaricati. Drupa exsucca, compressa.—Arbor Indica, foliis impari- v. supradecomposite pinnatis, umbellis paniculatum dispositis.

XXX. *Cussonia.* Styli 2–3, basi connati. Drupa baccata, subglobosa.—Arbores Africæ tropicæ, foliis palmatis v. digitatis; floribus umbellatis, racemosis v. spicatis.

XXIX. Heteropanax, Seem. Fl. Vit. p. 114, in adnot. Pedicelli inarticulati. Flores ecalyculati, hermaphroditi. Calyx tubo obconico, limbo minute 5-dentato. Petala 5, ovata, 1-nervia, æstivatione valvata. Stamina 5. Ovarium 2-loculare, loculis 1-ovulatis. Styli 2, liberi, demum divaricati. Drupa exsucca, didyma, compressa, 2-pyrena. Albumen ruminatum.—Arbuscula inermis Indiæ orientalis, foliis alternis simpliciter impari- v. supradecomposite pinnatis, foliolis petiolulatis ovatis acuminatis integerrimis, umbellis paucifloris paniculatis, pedunculis pedicellis calycibusque stellato-tomentosis, floribus odoratis.—*Panacis* sp. auct. Species unica:

1. *H. fragrans*, Seem. l. c.—*Panax fragrans*, Roxb. Cat. Calc. 21; De Cand. Prodr. vol. iv. p. 254, excl. syn. Don.—Bootan (Griffith, n. 2073), Kumaon (Strachey et Winterbottom!), Sikkim, 2–4000 feet (Hooker fil. et Thomson!), Khassia (Hooker fil. et Thomson!), Calcutta Bot. Garden (Wallich! n. 4929 *b*), Assam plants (Jenkins!)—Very variable in foliage, some leaves being scarcely a foot long, others exceeding 4–5 feet in length, with petioles 2 feet and more. Don's *Hedera fragrans*, referred with a mark of doubt to this species by De Candolle, is *Pentapanax Leschenaultii*, Seem., a common Nepal plant.

XXX. Cussonia, Thunb. Nov. Act. Ups. iii. p. 212; Nov. Gen. i. p. 11.—Pedicelli inarticulati. Flores ecalyculati, hermaphroditi. Calyx tubo obovato, limbo 5–7-dentato v. truncato. Petala 5–7, libera, æstivatione valvata. Stamina 5–7. Ovarium 2- v. per excessum 3-loculare, loculis 1-ovulatis. Styli 2 v. per excessum 3, basi connati. Drupa baccata, globosa, leviter compressa, 2- v. per excessum 3-locularis. Albumen ruminatum.—Arbores v. frutices Africæ tropicæ v. subtropicæ, inermes; foliis alternis palmatis v. digitatim 5–9-foliolatis,

foliolis simplicibus v. compositis (lomentaceis); floribus umbellatis, racemosis v. spicatis.

This genus is allied to *Sphærodendron*, from which it differs chiefly by its ruminate albumen; and it is possible that some *Cussonias* will have to be transferred to it when their fruit shall have become known. To restrict *Cussonia* to the species with spicate flowers, as Miquel wishes to do, appears to me impracticable.

* *Folia palmata.*

1. *C. Natalensis*, Sond. in Sond. et Harv. Fl. Cap. ii. 561.—Natal (Gueinzius; Gerrard! in Mus. Brit.).

2. *C. Gerrardii* (sp. nov.), Seem. mss. in Mus. Brit.; glabra; foliis palmato-5-lobis, lobis ovatis longe acuminatis glanduloso-inciso-serratis, 5-nerviis, subtus reticulatis v. supremis ovato-acuminatis; umbellis paniculatim dispositis, paniculis axillaribus.—Natal (Gerrard! in Mus. Brit.).

3. *C. arborea*, Hochst. mss. ex A. Rich. Tent. Fl. Abyss. i. 356, p. 58; Walp. Ann. ii. p. 723.—Abyssinia (Schimper! in Herb. Hook.).

** *Folia digitata.*

4. *C. umbellifera*, Sond. Linnæa, xxiii. p. 49; Walp. Ann. ii. p. 123; Harvey et Sond. Fl. Cap. ii. p. 570; Dietr. Fl. Univ. fasc. 9 (1856), t. 90.—*C. paniculata*, E. Mey. non Eckl. et Zeyh.—Natal (Drége! Sanderson! Sutherland! Gerrard!).

5. *C. (?) Bojeri* (sp. nov.), Seem. mss. in Mus. Brit.; glabra; foliis 3-foliolatis, foliolis lineari-lanceolatis acutis, basi connatis; umbellis paucifloris in paniculas axillares dispositis, ovario 2-loculari; fruct. ignot.—Madagascar (Bojer! Blackbourn!). Ripe fruit being unknown, the genus is somewhat doubtful.

6. *C. thyrsiflora*, Thunb. Nov. Act. iii. t. 12; De Cand. Prodr. iv. p. 255.—*C. thyrsoidea*, Pers. Euch. i. p. 98.—Cape of Good Hope (Fr. Masson! Roxburgh! in Mus. Brit.; Sir F. Gray! Zeyher! Burchell! in Herb. Hook.).

7. *C. calophylla*, Miq. in Ann. Sci. Nat. ser. 3, vol. i. p. 36 (1844); Walp. Rep. v. p. 925.—*C. Kraussi*, Hochst. in Flora (Ratisb.), 1834, p. 431; Walp. Rep. v. p. 925. *Sciadophyllum Comorense*, Boj. mss.—Natal (Gueinzius!), Orange Free State (Cooper!), Comoro Islands (Bojer!), Mohely (Boivin!).—Miquel's name seems to have the priority by a few months over Hochstetter's. In leaf often resembling *C. thyrsiflora* and *C. paniculata*.

8. *C. Kirkii* (sp. nov.), Seem.; arborea; foliis digitatim 9-foliolatis, foliolis ovalibus longe acuminatis basi attenuatis, supra venulis depressis, subtus venulis reticulatis elevatis; floribus spicatis.—Moramballa, South Africa (Kirk!). "Tree, about 20 feet high; leaves at the extremities of the branches. Stem, when cut, yields a gum. Flower-spikes numerous from amongst the leaves" (*Kirk, ms.*). Named in honour of its discoverer, Dr. Kirk, and allied to *C. arborea*, from which it differs by its truly digitate leaves, *C. arborea* having deeply divided palmate ones.

9. *C. Barteri* (sp. nov.), Seem. mss. in Herb. Kew.; foliis digitatim 5-foliolatis, foliolis subcuneato-obovatis acuminatis integerrimis glabris; floribus spicatis, spicis tomensis; drupis baccatis (albis).—Dry rocky hills, Niger River (Barter! in Herb. Hook.).

10. *C. spicata*, Thunb. Nov. Act. Upsal. iii. p. 212, t. 13; De Cand. Prodr. iv. p. 255.—*C. triptera*, Colla, Hort. Rip. 43, t. 26.—Caffraria and Cape of Good Hope (Niven! F. P. Oldenburg! in Mus. Brit.; Drége! in Herb. Hook.), Tschirandzura (Kirk!).

11. *C. paniculata*, Eckl. et Zeyh. n. 226; Sond. et Harvey, Fl. Cap, ii. p. 569.—Cape of Good Hope (Drége; Zeyher! n. 746; Burke!), Natal (Gerrard! 1265), Basuta Land (T. Cooper!).

Species exclusa.

C. Lessoni, A. Rich.=*Pseudopanax Lessoni*, C. Koch.

CORRESPONDENCE.

The new Purple Clover found in Cornwall.

Royal Agricultural College, Cirencester, Aug. 21, 1866.

I have a few heads of the Purple Clover figured in your 'Journal of Botany, t. 13, which I found on some of the Cornish headlands near St. Austell. I saved them for seed, and shall communicate the results to you.

I have looked here in vain for *Woolffia arrhiza*. Mr. Carruthers showed me specimens of it, so I should recognize the plant if I should meet with it.

I found repeatedly in different places, all far away from cultivation, a Geranium which I cannot help thinking is *G. striatum*. Of this plant also I have seeds. It is sparingly distributed along the coast of South Cornwall, some miles on either side of Charlestown, near St. Austell. If my determination of the species is correct, the plant *must be* truly wild.

Yours, etc., A. H. CHURCH.

Foliicolous Sphæriæ.

In my paper published in the last number of this Journal, the references to the Plates are wrongly given. In all instances where XLIX. is named it should have been L., and where L. is quoted it should have been LI., except in the "Explanation of Plates," wherein the figures are correct.

Yours, etc., M. C. COOKE.

Piper Tigerianum.

Geneva, August 8, 1866.

Having misread one of Barclay's labels "Tigu Island" for "Tiger Island," and in consequence named a new species of *Piper* from Honduras, *P. Tiguanum* (Journ. of Botany, 1866, p. 218), I now beg to substitute for that unfortunate name that of *Tigerianum.*

Yours, etc., CASIMIR DE CANDOLLE.

NEW PUBLICATIONS.

Manuel de la Flore de Belgique. Deuxième édition, considérablement augmentée. Par F. CRÉPIN. Brussels: Mayolez. 1866. 8vo, pp. 384.

The first edition of M. Crépin's handbook was published in 1860, and is pretty well known in this country. The six years which have elapsed since its issue have been a time of great activity amongst the Belgian botanists. As M. Crépin writes:—"In 1862 the Royal Botanical Society of Belgium was founded, and placed at its head a man* who linked the past with the present, and upon whose activity and devotion it could rely. Altogether only four years old, it has already done good work, and made itself favourably known abroad. Its members have increased at every meeting, and its reports are becoming more and more interesting and voluminous." Of this activity the volume before us bears full testimony. That part of it which relates in detail the distinctive characters and distribution of the species is almost doubled in extent. M. Crépin does not profess to characterize the subordinate critical forms, but of all the well-marked species, and of some that are not well-marked, he gives careful analyses on the dichotomous or Lamarckian plan, and a detailed sketch of the Belgian distribution of each with the special stations of the rarities.

* Dumortier.

For Belgium, as a whole, he admits now, of flowering plants and Ferns, 1240 good indigenous species, 53 "litigieuse," and 46 "douteuse" species, total 1339, to which 43 are added as naturalized, 62 as subspontaneous, and 98 as cultivated on a large scale. Nearly all of the 1339 which we have in Britain are admitted as distinct in Babington's 'Manual,' and in this estimate *Rubus fruticosus* counts for one only.

M. Crépin's botanico-geographical divisions of Belgium are as follows:—

1. A Jurassic region, confined to a small part not more than 300 square miles in area of the south-east of the province of Luxembourg, underlaid by Secondary Limestones.

2. An Ardennaise region, a rugged hilly region, which occupies the remainder of the S.W. of Belgium, being an extension of the Vosges, forming the watershed between the Meuse and the Moselle, the principal rock Silurian slate, and the highest point about 2000 feet.

3. A Central region, including the whole of Hainault and Namur, most of Brabant and Liége, the southern half of West and the southern third of East Flanders. In the southern part of this the rocks are calcareous, in the north argillo-arenaceous, and the precise limits between the two are still to mark out.

4. A Northern region, bounded on the south by a line which runs from west to east from Dixmude, in East Flanders, south of Ghent and Mechlin, between Louvain and Aerschot, and almost coincident with the Limburg boundary to the Meuse. This is divided into three tracts:—1st. The Campine, a region of moors, bogs, and marshes, and wide tracts of sandy heath, covered with Broom and stunted Firs, which includes most of the province of Limburg and a considerable part of that of Antwerp. 2nd. The tract of the Polders, principally land reclaimed from the sea by means of great care and ingenuity by the Flemings, and often fertile and highly cultivated; and, 3rd. The sand-hills or dunes along the extreme coast-line, and through these he traces the distribution of the species with great care.

As regards the species question, M. Crépin combines faith in their absolute limitability and a full knowledge of the writings of the modern French school with a strong disposition to call in question the proposed species of M. Jordan and Boreau, and both an advocacy and practice of the study of plants under cultivation. We give a few examples of his critical remarks:—

"*Matricaria maritima*, L. The numerous observations which I have made both upon the coast and in the Polder tract, have led me to think that this is not essentially distinct from *M. inodora*, but is only a variety due to the influence of chloride of sodium. On the coast, or where the soil is strong amongst the Polders, it assumes well-marked characters, but by degrees, as we advance into the interior, we see them disappear. Already Mr. Lloyd has obtained from seed one from the other in a single year. His results have been disputed, but I believe that if they were renewed their exactness would be confirmed. For the rest, the characters of *M. maritima* are not constant, for I have seen it with capitula not depressed at the base, with receptacle appreciably longer than broad, and with glands at first orbicular and afterwards oval. In both forms the two glands, which are found under the summit of the achenium on the outerside are prominent in the living plant, but when the fruit is dry they are depressed and changed into cavities.

"*Rosa canina*. Is the *R. canina* of the older authors an excessively polymorphous type, or is it made up of an association of different species? Is it in *Rosa* what *fruticosus* is in *Rubus?* This is a question which it is very difficult to answer. I give a dichotomous analysis of the principal forms met with in this country:—

"*a* Leaflets with simple teeth . . . . *b*
Leaflets with compound teeth . . . . *d*
b Leaflets rough below, glandular on all or nearly all the veins; pedicels glabrous, rarely a little glandular . . . *R. trachyphylla*, Rau.
Leaflets not glandular below or only glandular on the midrib . . *c*
c Calyx-tube and fruit globular . . . . *R. globularis*, Franch.
Calyx-tube and fruit ovoid . . . . *R. dumalis*, Bechst.
d Leaflets quite glabrous below . . . . *e*
Leaflets pubescent or more or less tomentose below, sometimes on the veins only . . . . *g*
e Calyx-tube subglobose, fruit spherical . . . . *R. sphærica*, Grev.
Calyx-tube ovoid; fruit ovoid, ovoid-oblong or pyriform . . . . *f*
f Pedicel and calyx-tube more or less setose . . *R. Andevagensis*, Bast.
Pedicel and calyx-tube naked . . . . *R. canina*, L.
g Leaves pubescent only on the veins below . . . . *R. urbica*, Lém.
Leaves pubescent below over the whole surface . . . . *h*
h Calyx-tube globular; fruit thick, subglobose or spherical, crowned for a long time by the erect subpersistent sepals *R. coriifolia*, Fries.
Calyx-tube and fruit ovoid; sepals deciduous . . . . *i*
i Pedicels not setose . . . . *R. dumetorum*, Thuill.
Pedicels more or less setose . . . . *R. collina*, Jacq."

"*Galeopsis angustifolia*, Ehrh. *G. Ladanum*, Auct. Leaves narrow, lanceolate or linear, with 1 to 3 pairs of teeth, rarely 4 or 5 or entire; corolla-tube conspicuously surpassing the calyx. This species is very variable, and its principal varieties have been elevated to the rank of species, I believe wrongly. Its leaves may be broad (var. *latifolia*, *G. latifolia*, Hoffm.) or narrow (var. *angustifolia*); its flowers vary much in their dimensions; the plant may be charged with abundant whitish villosity, var. *canescens* (*G. canescens*, Schult.), or it may be slender or stout, with a stem little or much branched. *G. arvatica*, Jord., and *G. Laramberguei*, De Mart., are only, I believe, simple varieties of this type. A crowd of intermediate variations link the principal forms together.

"*G. intermedia*, Vill. Leaves ovate-lanceolate, with 4 to 8 pairs of close teeth; corolla-tube but slightly surpassing the calyx. This species, although very near to *G. angustifolia*, can never be confounded with it when properly known.

"*Ulex Europæus*, L. I have found in abundance in a fir wood at Aeltre (E. Flanders), a very curious form, which I have called provisionally var. *spurius*. It is much more slender than the type, more delicate in all its parts, with stems less erect, rough and often diffuse, with leaves and young branches arcuate towards the base, with flowers a little smaller; calyx slightly less hairy; bracteoles ovate-lanceolate, either equalling or surpassing very slightly the breadth of the summit of the peduncle, half as narrow as those of the typical plant. This singular form seems to establish a passing between *Europæus* and *Gallii*."

We are sorry to see several changes, where specific names for common plants, which have been universally adopted, are altered, as, for instance, *Silene inflata* to *S. venosa*, *Barbarea vulgaris* to *B. lyrata*, *Nasturtium officinale* to *N. fontanum*. In conclusion, we recommend the book cordially to the attention of our home botanists.

BOTANICAL NEWS.

The second fasc. of the second section of vol. xv. of De Candolle's 'Prodromus' has just been published. With the first fasciculus by Boissier, already in the hands of botanists, we have now the complete monograph of the Natural Order

Euphorbiaceæ; and this fasciculus, by Dr. Müller, of Argau, is especially remarkable for the number of old synonyms which have been classed from the examination of authentic specimens, for the profound treatment of the subject, and the remarkable intelligence of the natural method shown by its authors.

A valued correspondent draws our attention to the 'Journal of Botany' for April last, p. 121, where Dr. St. Brody prints a list of "New Gloucestershire Plants," and introduces it with the remark that "*none* of the species are given by Mr. Watson for the south Severn province." But Mr. Watson's list, to which alone he can refer, excludes the admittedly introduced plants. Nearly all the really British plants in Dr. St. Brody's list *are* enumerated in Mr. Watson's list for south Severn. We would add that this mistake was known to us, and led to an erratum being put on the last page of the May number; but as that may possibly be overlooked, it is perhaps advisable to insert here a prominent correction.

We are glad to be able to welcome Dr. David Moore and Mr. Alex. G. More's 'Contributions towards a Cybele Hibernica' (London: Van Voorst).

Several interesting botanical papers have been submitted to the meetings of the British Association at Nottingham, on which we shall fully report.

One of our contributors, Mr. Ernst, is now in publishing in a Spanish weekly paper of Caracas, 'El Provenir,' an interesting series of articles on the most characteristic forms of the Venezuelan Flora, of which we have received nos. 6 and 8, treating of the Palms.

On the 25th of June, died at Tovar, Republic of Venezuela, Mr. Charles Moritz, a well-known botanical collector, who for many years resided in Venezuela, and was enabled to add largely to our knowledge of its flora. He was a German by birth and was seventy years of age when he died. His private herbarium has become the property of the British Museum.

It is gratifying to learn that the recent disturbances on the Continent have not proved hurtful to the oldest scientific body this side the Alps, the Imperial German Academy Naturæ Curiosorum. During the Prussian occupation of Dresden, its library, which is now in excellent working order, was guarded by the military, and no soldiers were billeted upon the Academy during the whole of that time. A new volume of the 'Nova Acta,' giving ample proof of the youthful vigour of this venerable scientific body, has just been published, containing amongst others three valuable botanic memoirs, viz. on *Aphyllostachys*, a new genus of fossil plants belonging to *Calamarieæ*, by Dr. Goppert; on saxicolous species of *Opegrapha*, by Dr. Stizenberger; and on "*Euptychium*, muscorum Neocalidonicum genus novum, et genus *Spiridens* revisum specieque nova auctum," by Dr. Schimper; all illustrated by plates.

In a letter to the 'Athenæum,' Miss Isabella Gifford complains that Mrs. Lane Clarke has taken from her 'Marine Botanist' the descriptions of all the classes, tribes, and genera, and incorporated them without acknowledgment in her 'Common Seaweeds.'

The next number of this Journal will probably contain a figure of the Newfoundland *Calluna*, which is specifically distinct from our common Heather, but identical with the Iceland one and some specimens from Scotland.

Tab. 53.

Fitch, del. et lith.

Vincent Brooks, Imp.

ON THE NEWFOUNDLAND HEATHER.

By Berthold Seemann, Ph.D., F.L.S.

(Plate LIII.)

Dr. D. Moore has kindly supplied me with fresh specimens of the Heather which he received some years ago from Newfoundland, and which has been growing since then side by side with the common European Heather in the Glasnevin Gardens. It did not escape so acute an observer as Dr. Moore that *biologically* the Newfoundland Heather was different from the common British one; that whilst the Newfoundland one always suffered from frost, and turned brown during the mild Irish winter, the common British form, growing by its side, was unaffected by cold, and retained its usual green colour. So whatever opinion botanists may arrive at respecting the systematic value of the Newfoundland Heather as a species, variety, or form, no argument can possibly set aside the biological distinction observed between the two.

At first sight the two plants look so very distinct that one could not possibly confound them, and nothing would seem easier than to form a good diagnosis for the two. But that is by no means the case. The leaves of the Newfoundland plant are always closely adpressed to the stem; those of *Calluna vulgaris* are generally patent; the pedicels of the Newfoundland plant are always naked; those of the true *C. vulgaris* are, especially those of the lowest flowers, foliaceous, so that they form little branchlets, terminating in a solitary flower (Fig. 7); whilst the sepals and petals of the Newfoundland plant are ovate and inflexed, those of the common British Heather are rather oblong and not inflexed.

Again, in the Newfoundland plant the tip of the flowering branches does not put forth fresh shoots whilst the flowering lasts; but in the common British Heather a fresh shoot issues when the flowering is at its height. I confess I should have liked to have been able to give more definite characters, but for the present I shall not be able to do so, having to defer the final settlement of the question to next season. At one time I thought that the length of the style offered an additional tangible character, but I find that that varies considerably, there being long and short-styled forms in our common British Heather. However, I fully believe that the Newfoundland plant is a distinct species, which I

would like to name *Calluna Atlantica*, and which I have also seen from Iceland and the higher Alps. Perhaps some Scottish specimens may also be referred to it. In German gardens there is cultivated a Heather under the name of *Calluna vulgaris flore pleno*. It agrees in foliage with my *C. Atlantica*, and does not stand the Continental winters in the open air, having to be treated as a greenhouse plant. Possibly this may belong to *C. Atlantica*, but I should not like to commit myself on this and other points connected with the natural history of these plants until I have once more an ample opportunity of investigating the whole matter. One thing is certain, that botanists would do well to look more closely at the genus *Calluna* than they have done, and not assume that it is only composed of one species when Nature herself points out to them such important biological differences as those observed by Dr. Moore.

EXPLANATION OF PLATE LIII.—Fig. 1. *Calluna Atlantica*. 2. *Calluna vulgaris*, L. 3. Flower of *C. Atlantica*. 4. Stamens of ditto. 5. Stamen of *C. vulgaris*. 6. Gynœcium of *C. Atlantica*. 7. Flower of *C. vulgaris*.

SCHEUCHZERIA PALUSTRIS, Linn.

BY THE REV. W. A. LEIGHTON, M.A.

This rare plant was first discovered in England in 1787, at Lakeby Car, near Boroughbridge, Yorkshire, by the Rev. James Dalton, and figured in E. Bot. t. 1801, in 1807. Since that date it has been found in Thorne Moor, near Doncaster, Yorkshire, on the moss on the west side of Bomere Pool, and also on the adjoining Shomere Moss, near Shrewsbury, in 1824, by John Jendwine, Esq., Second Master of Shrewsbury School; and at Methven, near Perth, by Mr. Duff. The careful researches of the Rev. O. M. Fielden, incumbent of Welsh Frankton, Shropshire, have been rewarded by finding this summer (1866), three specimens of it (one of which is now before me) in Welsh Hampton Moss, Shropshire.

Shrewsbury, Sept. 24, 1866.

NOTE ON THE AFFINITY OF FERNS.

BY J. SMITH, A.L.S.

At page 253 of this Journal, Dr. Hance replies to my remarks at

page 15 of the current volume, on his views of the genus *Brainea*. To what I there stated I have but little to add. The different views taken by pteridologists seem to arise chiefly by some giving preference to the principles of the *Linnæan School*, while others to those of *Jussieu;* by the former, *Brainea* is correctly placed in alliance with *Gymnograms*, and by the latter with *Sadleria*.

In my 'Ferns British and Foreign,' I have endeavoured to show the principle on which I founded my views, the relative value of the different organs employed in the classification of Ferns, and the conclusions I have arrived at after a study of the subject for above forty years, assisted by an extensive Herbarium* of my own, ample opportunity of consulting the late Sir William Hooker's, and studying nearly one thousand living species under my supervision for a number of years. The study of these materials has led me to arrive at affinities in many cases different from that held by other pteridologists; and with the explanation given in that book it does not seem necessary to enter further into the subject at this place.

In my original article at page 15, in speaking of the Darwinian theory, the word *not* has been omitted, either in the MSS. or by the printer, and the statement consequently conveys a meaning contrary to what I intended, and so may have caused my views to be misunderstood. The sentence should be, "then the Cycad-looking stem of *Brainea* should *not* be compared with humble *Gymnograms*."

Kew, September 14, 1866.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The British Association met at Nottingham on the 22nd of August and following days, under the Presidency of Wm. Grove, Esq., Q.C., the famous physicist. In his inaugural address he exhibited in a triumphant light the progress of science, the subtlety of its observations, the grandeur of its discoveries, and the wide view which they open out into the realms of nature and her laws, their harmonious operation, their marvellous unity and system, the prodigious scale of the forces they engender, and the mode in which the greatest variety of effects results from the simplest principles.

* Now in the British Museum.

In his review of science he gave a unity to his observations by dwelling on a particular aspect of its progress, which he thus explains:—

"One word will give you the key to what I am about to discourse on; that word is *continuity*,—no new word, and used in no new sense, but perhaps applied more generally than it has hitherto been. We shall see, unless I am much mistaken, that the development of observational, experimental, and even deductive knowledge, is either attained by steps so extremely small as to form really a continuous ascent; or, when distinct results, apparently separate from any co-ordinate phenomena, have been attained, that then, by the subsequent progress of science, intermediate links have been discovered uniting the apparently segregated instances with other more familiar phenomena.

"Thus the more we investigate, the more we find that in existing phenomena graduation from the like to the seemingly unlike prevails, and in the changes which take place in time, gradual progress is, and apparently must be, the course of nature."

After the examination of the physical sciences, he finds in Darwinism a striking illustration and proof of the continuity of natural phenomena, and gives the following botanical notes in support of his views:—

"Professor A. De Candolle, one of the most distinguished Continental botanists, has, to some extent, abandoned the tenets held in his 'Géographie Botanique,' and favours the derivative hypothesis in his paper on the variation of Oaks; following up a paper, by Dr. Hooker, on the Oaks of Palestine, showing that some sixteen of them are derivative, he avows his belief that two-thirds of the 300 species of this genus, which he himself describes, are provisional only.

"Dr. Hooker, who had only partially accepted the derivative hypothesis propounded before the publication of 'The Origin of Species through Natural Selection,' at the same time declining the doctrine of special creation, has since then cordially adopted the former, and illustrated its principles by applying them to the solution of various botanical questions; first, in reference to the flora of Australia, the anomalies of which he appears to explain satisfactorily by the application of these principles; and, latterly, in reference to the Arctic flora.

"In the case of the Arctic flora, he believes that originally Scandinavian types were spread over the high northern latitudes, that these

were driven southwards during the glacial period, when many of them changed their forms in the struggle that ensued with the displaced temperate plants; that on the returning warmth, the Scandinavian plants, whether changed or not, were driven again northwards and up to the mountains of the temperate latitudes, followed, in both cases, by series of pre-existing plants of the temperate Alps. The result is the present mixed Arctic flora, consisting of a basis of more or less changed and unchanged Scandinavian plants, associated in each longitude with representatives of the mountain flora of the more temperate regions to the south of them.

"The publication of a previously totally unknown flora, that of the Alps of tropical Africa, by Dr. Hooker, has afforded a multitude of facts that have been applied in confirmation of the derivative hypothesis. This flora is found to have relationships with those of temperate Europe and North Africa, of the Cape of Good Hope, and of the mountains of tropical Madagascar and Abyssinia, that can be accounted for on no other hypothesis, but that there has been ancient climatal connection and some coincident or subsequent slight changes of specific character."

The following were the papers bearing upon botany which were read at the Association, with lengthened abstracts of several of which we are able to present our readers:—

H. Hennessy, F.R.S.—On the probable cause of the existence of a North European Flora in the West of Ireland, as referred to by the late Professor E. Forbes.

John Hogg, F.R.S.—On the ballast Flora of the coasts of Durham and Northumberland.

Dr. J. D. Hooker.—On Island Floras.

W. Moggridge.—On the occurrences of *Lemna arrhiza* in Epping Forest. *Vide ante*, p. 263.

W. Moggridge.—On the zones of the Coniferæ from the Mediterranean to the crest of the Maritime Alps.

E. Perceval Wright, M.D.—Botanical notes of a Tour in the Islands of Arran, West of Ireland.

N. B. Ward, F.R.S.—The Poor Man's Garden.

John Shaw.—On the distribution of Mosses in Great Britain and Ireland as affecting the geography and geological history of the present Flora.

Clements R. Markham, F.L.S.—On the results of the Cinchona cultivation in India.

Professor Oswald Heer.—On the Miocene Flora of North Greenland.

W. S. Mitchell, LL.B.—On the Fossils of the Leaf-bed at Alum Bay, in the Isle of Wight.

Dr. Foster.—Discovery of ancient trees below the surface of the land, at the Western Dock, now being constructed at Hull.

On the Miocene Flora of North Greenland. By Professor Oswald Heer.

The Royal Dublin Society is in possession of a rich collection of fossil plants, which have been brought from Arctic Regions by Captain Sir F. Leopold M'Clintock, and Captain Philip H. Colomb at various times, and have been presented by these gentlemen to the Society. The Society have entrusted the whole collection to me for examination. Before I received these, Dr. J. D. Hooker had entrusted to me specimens which had been presented to the Museum at Kew by Dr. Lyall and Dr. Walker. In this collection I discovered seven determinable species, which are also to be found among the specimens of the Dublin collection, which consists of sixty-three recognisable species. If we add to this the additional species mentioned by Brongniart and Vaupel (?), we obtain a total of sixty-six species.

All the specimens of the Dublin and Kew collections come from Atanekerdluk, as do also the specimens which Captain E. A. Inglefield brought home, of which he deposited a portion in the Museum of the Geological Survey, and retained a portion in his own hands. The former have been kindly sent to me by Sir Roderick Murchison, while I have obtained the latter through the goodness of their owner.

Atanekerdluk lies on the Waigat, opposite Disco, in lat. 70°. A steep hill rises on the coast to a height of 1080 feet, and at this level the fossil plants are fonnd. Large quantities of wood in a fossilized or carbonized condition lie about. Captain Inglefield observed one trunk thicker than a man's body standing upright. The leaves, however, are the most important portion of the deposit. The rock in which they are found is a sparry iron ore, which turns reddish-brown on exposure to the weather. In this rock the leaves are found, in places packed closely together, and many of them are in a very perfect condition. They give us a most valuable insight into the nature of the vegetation which formed this primæval forest.

The catalogue which I append to this paper will give a general idea of the Flora of this forest of Atanekerdluk, but before we proceed to discuss it, I must make a few remarks.

(1.) *The fossilized plants of Atanekerdluk cannot have been drifted from any great distance. They must have grown on the spot where they are found.* This is proved,

(*a*) By the fact that Captain Inglefield and Dr. Rink observed trunks of trees standing upright.

(*b*) By the great abundance of the leaves, and the perfect state of preservation in which they are found. Timber, hard fruits, and seeds may often be carried to a great distance by ocean currents; but leaves always fall to pieces on such a long journey, and they are the more liable to suffer from wear and tear the larger they are. We find in Greenland very large leaves, many of which are perfect up to the very edge. It is, however, difficult to work them out from a stone which splits very irregularly, and consequently we can hardly show the entire leaves in a perfect condition.

(*c*) By the fact that we find in the stone both fruits and seeds of the trees whose leaves are also found there. Thus, of *Sequoia Langsdorfi* we see not only the twigs covered with leaves, but also cones and seeds, and even a male catkin; of *Populus, Corylus, Ostrya, Paliurus*, and *Prunus*, there are leaves and some remains of fruit, which could not be the case if the specimens had drifted from a great distance.

(*d*) By our finding remains of insects with the leaves. There is the elytron of a small beetle, and the wing of a good-sized insect.

(2.) *The Flora of Atanekerdluk is Miocene.*

Of the sixty-six species of North Greenland, eighteen occur in the Miocene deposits of central Europe. Nine of these are very widely distributed both as to time and space, viz. *Sequoia Langsdorfi, Taxodium dubium, Phragmites Œningensis, Quercus Drymeia, Planera Ungeri, Diospyros brachysepala, Andromeda protogæa, Rhamnus Eridani*, and *Juglans acuminata*. These are found both in the upper and lower Molasse, while some species, viz. *Sequoia Couttsiæ, Osmunda Hebrii, Corylus Macquarrii*, and *Populus Zaddachi*, have not as yet been noticed in the upper Molasse. From these facts it seems probable that the fossil forest of Atanekerdluk flourished in that high northern latitude at the lower Miocene epoch.

(4.) *The Flora of North Greenland is very rich in species.*

This is evident from the great variety of plants which the specimens exhibit. Although the amount of material obtained from Atanekerdluk is of small extent compared with that which has come from the Swiss localities, yet many of the slabs contain four or five species, and in one instance even eleven. Atanekerdluk has been only twice visited, so that we have got only a glimpse of the treasures buried there, and which await a more careful search. At Disco and Hare Island there are extensive beds of brown coal, in whose neighbourhood we may fairly expect to find fossil plants. In fact, Professor Grefpech mentions three species from Eook (?) in lat. 70° N., *Pecopteris borealis*, *Sequoia Langsdorfi*, and *Zamites arcticus*, which, strange to say, he has described (in his 'Jahrbuch für Mineralogie,' 1866, p. 134).

(4.) *The Flora of Atanekerdluk proves, without a doubt, that North Greenland, in the Miocene Epoch, had a climate much warmer than its present one.* The difference must have been 16° C.

Professor Heer discusses at considerable length this proposition. He says that the evidence from Greenland gives a final answer to those who objected to the conclusions as to the Miocene climate of Europe drawn by him on a former occasion. It is quite impossible that the trees found at Atanekerdluk could ever have flourished there if the temperature were not far higher than it is at present. This is clear, firstly from many of the species of which we find the nearest living representative 10° or even 20° of latitude to the south of the locality in question. Some of the specimens are quite peculiar, and their relationship to other forms is as yet in doubt. Of these the most important are a *Daphnogene* (*D. Kanii*), the genus *MacClintockia*, and a *Zamites*. The *Daphnogene* had large, thick, leathery leaves, and was probably evergreen. *MacClintockia*, a new genus, comprises certain specimens belonging, perhaps, to the *Proteaceæ*. *Zamites* is also new. Inasmuch as we know no existing analogues for these plants, we cannot draw accurate conclusions as to the climatal conditions in which they flourished. It is, however, quite certain that they never could have borne a low temperature.

If, now, we look at those species which we may consider as possessing living representatives, we shall find that, on an average, the highest limit attainable by them, even under artificial culture, lies at least 12° to the southward. This, however, does not give a fair view of the circumstances of the case. The trees at Atanekerdluk were not all at

the extreme northern limit of their growth. This may have been the case with some of the species; others, however, extended much farther north, for in the Miocene flora of Spitzbergen, lat. 78° N., we find the Beech, Plane, Hazelnut, and some other species, identical with those from Greenland. For the opportunity of examining these species, I am indebted to Professor Nordenskiold. At the present time the Firs and Poplars reach to a latitude 15° above the artificial limit of the Plane, and 10° above that of the Beech. Accordingly, we may conclude that the Firs and Poplars which we meet at Atanekerdluk and at Bell Sound, Spitzbergen, must have reached up to the North Pole, in so far forth as there was land there in the Tertiary period. The hills of fossilized wood found by M'Clure and his companions in Banks's Land (lat. 74° 27′ N.) are therefore discoveries which should not astonish us; they only confirm the evidence as to the original vegetation of the Polar regions which we have derived from other sources. The Professor then proceeds to say that the whole course of reasoning which led him to the conclusion that the Miocene temperature of Greenland was 16° C. higher than its present one, was too long to be included in a paper like the present one; it would be fully developed in his work "On the Fossil Flora of the Polar Regions," which will contain descriptions and plates of the plants discovered in North Greenland, Melville Island, Banks's Land, Mackenzie River, Iceland, and Spitzbergen, and which he hopes to publish at an early date.

He then selects *Sequoia Langsdorfi*, the most abundant of the trees at Atanekerdluk, and proceeds to investigate the conclusions as to climate deducible from the fact of its existence in Greenland. *Sequoia sempervirens*, Lamb. (red-wood), is its present representative, and resembles it so closely that we may consider *S. sempervirens* to be the direct descendant of *S. Langsdorfi*. This tree is cultivated in most of the botanical gardens of Europe, and its extreme northern limit may be placed at lat. 53° N. For its existence it requires a summer temperature of 15° or 16° C. Its fruit requires a temperature of 18° C. for ripening. The winter temperature must not fall below − 1·3°, and that of the whole year must be at least 9·5° C. Accordingly we may consider the isothermal of 9·5° C. as the northern temperature of the *Sequoia Langsdorfi*, and 9·5° C. as the absolute minimum of temperature under which the vegetation of Atanekerdluk could have existed there.

The present annual temperature of the locality is about 6·3° C. Dove gives the normal temperature of the latitude (70° N.) as 8·8°. Thus Greenland has too high a temperature; but if we come further to the eastward, we meet with a temperature of 0·49° C. at Altenfiord. Even this extreme variation from the normal conditions of climate is 9° C. lower than that which we are obliged to assume as having prevailed during the Miocene period.

The author states that the results obtained confirm his conclusions as to the climate of Central Europe at the same epoch (conf. Heer, 'Recherches sur le Climat et le Végétation du Pays tertiaire,' p. 193), and shows at some length how entirely insufficient the views of Sartorius Waltershausen are to explain the facts of the case.

Herr Sartorius would account for the former high temperature of certain localities by supposing the existence of an insular climate in each case. Such suppositions would be quite inadequate to account for the extreme differences of climate which the evidence now under consideration proves to have existed.

Professor Heer concludes his paper as follows:—

I think these facts are convincing, and the more so as they are not insulated, but confirmed by the evidence derivable from the Miocene flora of Iceland, Spitzbergen, and Northern Canada. These conclusions, too, are only links in the grand chain of evidence obtained from the examination of the Miocene flora of the whole of Europe. They prove to us that we could not by any re-arrangement of the relative positions of land and water produce for the northern hemisphere a climate which would explain the phenomena in a satisfactory manner. We must only admit that we are face to face with a problem, whose solution in all probability must be attempted, and we doubt not completed, by the astronomer.

THE ALUM BAY LEAF-BED. By W. S. Mitchell, LL.B., F.G.S.

The bed known to geologists as the "Leaf Bed" or "Pipe-clay Bed" of Alum Bay, is the band of white clay which occurs in the lower Bagshot beds, in Alum Bay, about 200 feet from their base, numbered 42 in the memoir of the Geological Survey. It is about six feet thick, but a small portion, only a few inches in thickness, contains the plant remains, and no other organisms whatever have been noticed in it.

The occurrence of these plant-remains was first observed by the Geological Survey in 1853, and since then one or two collections have been made.

Dr. P. de la Harpe, of Lausanne, examined these, and gave a notice of several species in a paper on the "Flore tertiaire de l'Angleterre," which appeared in the "Bulletin de la Société Vaudoise des Sciences Naturelles" for June, 1856. In December, 1860, in conjunction with Mr. J. W. Salter, F.G.S., he prepared the list which is published in the memoir of the Geological Survey of the Isle of Wight.

This list includes the collections from "the same strata worked at Bournemouth and Corfe Castle, in Purbeck, Dorset;" yet for the compilation of it the total number of specimens that could then be brought together from the three localities was but about 300.

It is therefore no matter of surprise that in larger collections since made, many fresh forms are met with.

At the last meeting at Birmingham, I exhibited drawings of some few of the most striking new forms, and mentioned that both Dr. P. de la Harpe and Dr. Oswald Heer urged the importance of a more careful examination of the bud.

A committee for this purpose was appointed, and the sum of £20 was placed at our disposal. Through the kindness of Professor Sedgwick and the Vice-Chancellor of the University of Cambridge, we obtained the services of Mr. H. Keeping, now at the Woodwardian Museum, who has had much experience in the working of this bed.

I went down to Alum Bay last September with Mr. Keeping, and remained there during the working to note the appearance of the leaves when first turned up.

In the majority of instances not only the outline but the venation, even the most delicate, is at first clearly visible, though a few hours' exposure to the air almost obliterates the more delicate marks. A washing with a solution of isinglass often preserves them,—indeed, in some instances, brings them out even more sharply,—but unfortunately it often fails. There are some specimens on which I partly traced the venation with pencil as soon as they were exposed. Now, after an interval of ten months, they are so faded that the part not pencilled is hardly, if at all, to be made out. It is much to be regretted that there is a difficulty in preserving the specimens, and we shall be very glad to receive suggestions for their treatment. All our specimens have had

the usual isinglass wash, though I fancy it somewhat obscures the character of the surface of the leaves, and this is often a useful help in determining the genus. I had not anticipated such a result, and did not take any notes of this, but from the recollection I have of the appearance of the leaves when first seen, I am almost certain it was much clearer then than now. I hope to have an opportunity of again examining this bed, and I shall endeavour to take both drawings and descriptions of the leaves before the air and light have in any way injured them.

After a fortnight, the bad weather put a stop to our work. We had, however, succeeded in obtaining a good collection, numbering altogether some 470 specimens. The leaves are, on the whole, well preserved, but the bed in one part yielded forms so indistinctly marked as to be almost worthless. I have in course of preparation descriptions of all the leaves in this, as well as in my own collection, which I will lay before one of the learned societies of London. Were they now complete this would not be the suitable place for reading them, and the publication of them in a report, without drawings, would much lessen their value.

I have brought drawings of some of the larger leaves, which show that the aid afforded by this Association for examining this bed has helped us to obtain, not only finer specimens than former writers had at their disposal, but also many fresh forms.

I decline to attempt to say the number of new species we are able to add to the list in the Survey memoir, for not only is the determination of fossil leaves at all times very unsatisfactory, but that list was not intended for a monograph, and has neither drawings, except a few, nor the exactness of description requisite for identification. Then, too, the nomenclature of fossil leaves is very unsatisfactory, the same fragment of a leaf having often half-a-dozen different names.

Discovery of Ancient Trees below the Surface of the Land, at the Western Dock now being constructed at Hull. By Dr. Foster, of Hull.

The paper stated, that at a depth of forty feet below the level of the adjoining land, trees (almost entirely of oak) are to be met with in all positions, having been broken off within three feet of the root. Some were of gigantic size. These trees could not be less than 3000 years old.

On the Migration of Cultivated Plants in reference to Ethnology. By John Crawfurd, F.R.S.

The migration of cultivated plants is wholly the work of man, and its history, therefore, a legitimate branch of ethnology. In so far as vegetable substance is concerned, the earliest food of man, on his first appearance on earth, must of necessity have consisted of wild fruits and roots, wild corns and wild pulses, and these would certainly be more abundant than we now find them. The plants resorted to for this purpose would necessarily vary with climate. In temperate regions, the seeds of spontaneous grasses and pulses, and of a few marine plants, with acorns and honey, would be had recourse to. In tropical and subtropical regions, the available vegetable food of the early savage would consist of the date, the cocoa-nut, wild cereals, the yam, and other spontaneous roots.

Some races of man are still found in the primitive condition thus described. The natives of Australia, to this day, cultivate no plant, and have no other vegetable food than a few wild roots. The natives of the Andaman Islands have for their vegetable food only a coarse wild bean, and the still coarser fruit of the mangrove. In a similar condition are the inhabitants of Tierra del Fuego and the Eskuimos.

Even of the nomadic tribes of Northern Arabia, the chief vegetable food, down to the present day, consists of two wild uncultivated plants, called in the Arabic language *sambh* and *mesàa*, but the technical denominations of which have not been determined. Speaking of the first of these, Palgrave says :—"The ripening season is in July, when old and young, men and women, are all out to collect the unsown and untoiled-for harvest."

In America, from Canada to Florida, there grows in marshy land, on the banks of lakes and rivers, a species of grass, the seeds of which yield a nutritious corn similar, but inferior, to the millets of the Old World. This, in one of the prevalent American languages, is called the *tuscarora* (*Zizania aquatica*). Although capable of cultivation, it has never been so, the superior maize having most probably dispensed with the necessity for it. It is, however, used as a food by the wandering American tribes, as the two plants named in the last paragraph are by the Bedouins. In Southern Africa, the fruit of a species of wild gourd, called the nara, about the size of a cocoa-nut, is used as food by the natives, who, when it is ripe, repair periodically to the plains where it grows, to feast upon it.

It would not be until, through increase of population, and wild plants had become scarce, that the ingenuity of man would be stimulated to multiply them by cultivation. We have an example of the early steps in this progress in the condition of society among the South-Sea islanders, both fair and negro, who, when first seen by civilized man, were found cultivating the yam, the taro, or esculent *Caladium*, the batata, the cocoa-palm, the banana, and the breadfruit, but no cereal and no pulse.

In the present paper, I propose to confine myself to the ethnological bearings of bread-plants, and begin with the most important of them, the cereals. These consist of wheat, barley, rye, oats, rice, maize, and several millets. Rye and oats are plants confined for the most part to Europe, but wheat and barley embrace a far wider range, for they extend to all the temperate, and even to the subtropical regions of the whole world, from Spain to Japan, while within the last 350 years they have been transferred, through the enterprise of European nations, to the corresponding climates of America and Australia, in neither of which did any one of the principal cerealia of Europe previously exist either in a wild or cultivated state. Rice is the principal cereal of all the tropical and subtropical countries of Asia, from Persia to Japan, and its culture has been extended to Europe only within the historical period. Maize is an exclusive product of America, and was as unknown to the Old World, before the first voyage of Columbus, as tobacco or the pine-apple. With a wider geographical range than any other of the cereals, it has invaded every country of the Old World, from the 50th degree of latitude, and is now the bread of many millions of people whose forefathers lived in ignorance of its existence. It is extensively cultivated in the southern provinces of China, in Japan, and in the islands of the Malay and Philippine archipelagoes. Speke and Grant found it the principal corn in parts of the interior of Africa which the feet of white man had never trodden before their own, and in Italy and Spain it was a frequent crop within fifty years of the discovery of the New World. This wide and rapid extension maize owed to its adaptation to diversities of soil and climate, its hardihood, with consequent facility of propagation, and its eminent fecundity.

With the exception of rice, which is found growing wild in some parts of India, but which yet may have sprung from the seeds of the cultivated plant, not one of the cereals now enumerated can be traced

with undoubted certainty, nor can we state their parent countries. This must be received as evidence of vast antiquity of cultivation. Ears of wheat and of barley have been found in the oldest Egyptian tombs of the same peculiar species or varieties as those cultivated in the same country at the present day; and in the Book of Genesis, in the poems of Homer, and in the oldest of the Hindu Vedas, these cereals are as familiarly referred to as they are now. Wheat and barley must have been well known to the Egyptians before the earliest of the pyramids was built, for a people feeding on roots and fruits could not have possessed the power or the skill indispensable to the construction of these stupendous monuments. The first culture of these corns, therefore, carries us very far back in the history of man himself. There is no good reason to think that wheat and barley may not have been just as early cultivated in Persia, India, China, and Japan, as in Egypt itself, although we have not the same satisfactory evidence of their having been so; and the same may be asserted of rice for tropical Asia, and even for maize in the case of the constructors of the temples of Mexico, and the builders of Palenque.

Millet, derived from the Latin *milium*, and coming to us indirectly in its present form through the French, is a common term for all the smaller cultivated cereals. These, of many species, are largely cultivated in all the warm countries of Europe and Asia, from the 40th degree of latitude to the equator. The most frequent of them belong to the genera *Panicum* and *Sorghum*, but they are not confined to these two. The late Dr. Hugh Falconer told me that the number of kinds of millet cultivated in the plains or mountains of India is no fewer than twenty-five. In Asiatic countries they form a large portion of the bread of the humbler classes. As to the history of their culture, it goes far beyond all record, and is probably of equal antiquity with that of wheat, barley, or rice. It is impossible to fix the parent country of any of these millets, and the probability is that they are indigenous in many, for we find them growing with the facility and vigour of native plants in such remote and unconnected regions as Italy, India, China, and Japan. Some of them are certainly found in a wild state, and even crops of some of these are occasionally gathered. In some parts of Asia, such as its islands, they seem to have been in a good measure superseded by the far superior corn, the American maize.

A great number of pulses, or leguminous plants, have been culti-

vated immemorially for food, at least in every part of the Old World. They belong to such genera as *Vicia*, *Faba*, *Pisum*, *Ervum*, *Lathyrus*, *Orobus*, *Cicer*, *Phaseolus*, *Dolichos*. In our narrow vocabulary they are all comprehended under the vernacular terms of peas, beans, vetches, lentils, etc. In those parts of Asia to which the principal cereal is rice, which contains but a small amount of gluten or nitrogenous matter, and where little animal matter is consumed, legumes are largely used as food to make up for the deficiency. Several of the cultivated legumes can be traced to their wild originals in Europe, while other sorts are traced to Africa, Asia, and to America. The only parts of the world that produce no native legumes fit for cultivation were Australia and New Zealand, where they were equally absent as the cereals. This arose from no inaptitude of the soil and climate, for they now flourish in these Austral regions, of every useful species.

The principal plants cultivated and yielding a farina, as substitutes for the bread of the cereals, are the common Potato or tuber-yielding *Solanum*, the Yam or *Dioscorea*, the Sweet Potato or tuber-yielding *Convolvulus*, the Sago-palm, the Breadfruit, and the Banana. There are other plants, such as those yielding arrowroot and tapioca, but of far less importance.

The common Potato (*Solanum tuberosum*) is an undoubted native of America, and there of a temperate climate. It is still found wild on the western slopes of the Andes, the tubers being no bigger than filberts. Even the rude red-man was found to have cultivated the Potato before the arrival of Europeans. It was brought from America direct to Ireland, and there first cultivated in 1586, or in about eighty years after the discovery of the New World. It is stated to have been still earlier introduced into Spain and Portugal. From Ireland it found its way to the Low Countries and to Germany, and from Spain it reached Italy and France. It is an object of cultivation in Asiatic countries only where Europeans have colonized or settled, and there chiefly for their consumption, and only since the beginning of the present century. It is successfully cultivated in Australia and New Zealand, which produced no esculent farinaceous root at all, not even the Yam, the Taro, or the Manioc.

The Yam (*Dioscorea*) is a native of tropical and subtropical climates. The genus to which it belongs is considered to consist of several distinct species, natives of both Asia and America, and in many places it

is still to be found in its wild state. The plant is a slender creeper, yielding a huge tuber, often weighing from ten up to thirty pounds, consisting of a great mass of farinaceous matter, a wholesome but dry and insipid food, greatly inferior in flavour to the common, or even to the sweet, Potato.

The Sweet Potato, or Batata (*Batatas edulis*), is, like the Yam, the plant of a warm climate. It is a native of the tropical parts of both Asia and America, but is stated not to have been an object of cultivation by the native Americans, the first mention of it being by Rigafetta, the companion of Magellan, in the first quarter of the fifteenth century. In the neighbourhood of the equator, the *Batata* grows to a large size, often weighing several pounds; in Java, I have myself seen them of ten pounds weight, and occasionally they are said to reach even to fifty. In that island they enter largely into the food of the people,—never, however, forming their principal vegetable diet, which is always rice.

One or more species of the genera *Ocimum*, *Arum*, *Caladium*, *Maranta*, *Tacca*, and *Jatropha* yield esculent roots, which, in a rude state of society, in their respective native countries, were the only bread of the people before the culture of the cerealia began. Their starch, in a refined state, comes to us under the names of arrowroot, tapioca, cassava, salep, etc. The plants yielding these productions are, with few exceptions, natives of tropical or, at least, of very warm countries. Some of them, in their crude and unprepared state, are either poisonous or acrid, but the savage cultivators had everywhere discovered that heat or edulcoration dissipated the poison, and rendered them wholesome food.

The Taro, or *Caladium esculentum*, formed the principal bread of all the South-Sea Islanders, who had no kind of corn; and the Manioc, or *Jatropha Manihot*, that of the rude inhabitants of native America, who had but one of the cereals, and even that one not universally known and cultivated.

The Breadfruit (*Artocarpus incisa*), in so far as concerns its use as bread, is confined to the tropical islands of the Pacific, to the inhabitants of which it formed a considerable article of diet, and, no doubt, contributed materially to the social advancement at which they had arrived when first seen by Europeans. At the recommendation of some theoretical botanists, the tree was conveyed, in 1792, at great

trouble and expense, to our West India Islands, but with little advantage. In the wild state the plant exists in the islands of the Malay archipelago, where, however, the immemorial possession of the cereals seems to have superseded the necessity of cultivating it.

Some species of the *Musa*, or Banana, which yield a lárge portion of farinaceous matter, are, either in their fresh or dry state, extensively used in the warm parts of America as bread, but, as far as I know, never so in any Asiatic country; and Baron Humboldt generalizes rashly when he asserts that in all tropical countries the Banana takes the place of the cereals of temperate and subtropical regions.

Sago, or more correctly Sagu, is the name of the pith of several Palms, natives of the Malayan and Philippine archipelagoes. The most productive of these Palms is the *Sagus Rumphii*, or *Metoxylon Sagus*. This and other species of the same genus have the peculiarity among Palms of propagating themselves both by lateral shoots and by seeds. They thrive only in bogs within the air of the sea, but excluding tidal action. A plantation once made perpetuates itself interminably. A sago palm acquires maturity in about fifteen years. The stem is a mere case containing an immense mass of medulla or pith, which, when freed from fibrous matter, is a starch which, dried and granulated, or subjected to heat in earthen moulds, forms the bread of all the people of the Malay archipelago east of Celebes, as far as New Guinea inclusive. It is consumed also in Sumatra, Borneo, and even Mindanao, the most westerly of the Philippines; but in these places, where the cereals have long existed, sago is the bread only of the poor, or of barbarous tribes.

Language often throws light on the birthplace and migration of cultivated plants; and I therefore proceed to offer such remarks as have occurred to me regarding those which I have now been referring to. To begin with the cereals, it will be found that they bear different names in every separate and independent language, or sisterhood of languages. In so far as philology can be considered evidence, this fact would seem to show, not that the culture of the cereals had originated at a single point, from which they were in course of time widely disseminated, but at many separate and independent points, foreign names only distinguishing them in the few instances in which they are exotics. Thus the English name for wheat is essentially the same in all the Teutonic languages. In Irish and Welsh, which are two dis-

tinct, independent languages, we find two different names for this corn, it being *cruineached* for the first, and *gwenith* for the last. The *trigo* of the Spanish and Portuguese is but a corruption of the *triticum* of the Latin; while the French *froment* and the Italian *frumento* are taken from a synonym of the same language. But in the Basque, which, according to competent judges, differs not only from all other European languages, but from all other tongues whatever, ancient or modern, we have two names for wheat wholly different from those of any other tongue, namely *garia* and *ocava*. Having alluded to this singular language, the Basque, I think the names of cultivated plants in it may be safely referred to as evidence of the comparative antiquity of their culture by the people speaking it. Thus the names for wheat, barley, and oats, are purely Basque, while those for rye (*cecalea*), for rice (*avroza*), for maize (*maiza*), and for the bean (*baba*) are Spanish. The inference is that the first-named plants were immemorially cultivated by the Basques, and the last only introduced into their country after the Roman conquest of Spain; indeed, after the Spanish language had assumed its present form.

If we look into the Oriental languages, we shall find in them evidence of the same tendency. In Sanskrit the name for Wheat is *godhum*, and in Persian *gandum*, essentially the same word; but, as the people who spoke the Sanskrit language are believed to have emanated from a country forming part of Persia, it is not difficult to account for the agreement in this case. In Hindi the name is *gehun*, which seems to be an original word. In the Tamil we have the Sanskrit word in the corrupt form of *gudumai;* but the people speaking this language occupy the extreme southern part of India, within from eight to twelve degrees of the equator, and where wheat will only bear fruit in a few elevated tracts; and hence, as an exotic, it bears a foreign name. In Turkish the name of wheat, *baghdoi*, is a native word. In Arabic we have two original and unborrowed ones, *hantah* and *bar*. From this, so far as etymology can be trusted, we infer that this corn is of indigenous culture both in the parent land of the Turks and in Arabia. In Java, within seven degrees of the equator, wheat will only yield grain at an elevation of 5000 feet above the sea-level, and here it is sometimes called by its Portuguese name of *trigo,* and sometimes by its Persian name of *gandum,*—pointing clearly enough to the parties who

introduced it, and even to the comparatively recent time in which it was introduced. An examination of the names for Barley point to similar results as in the case of wheat. This word itself, as it exists in our language, has not, that I am aware, been traced to its parent source; but the name of the hardy four-rowed barley, bere, belongs to the Teutonic family of languages, and it was probably the earliest, as the easiest variety cultivated in Britain. The French *orge* and the Italian *orzo* are but gross corruptions of the Latin *hordeum*. The names for barley in Gaelic and in Welsh are different, the first being *eorna*, and the last *haidd*. The name for Oats is essentially the same in these two tongues, namely, *core* for the Gaelic, and *ceirc* for the Welsh; but for Rye the name in both languages, *seagl*, is evidently taken from the Latin *secale*, and we shall not err if we conclude that this corn was directly or indirectly introduced into our islands by the Romans. The Basque, again, furnishes an original name for this grain, namely, *garagarra*. The Oriental languages furnish us with similar evidence in the case of barley, as it does in that of wheat. In Sanskrit the name for it is *yava*, of which the Hindi *jau* and the Persian *jo* are certainly corruptions. In the language of the distant Tamils it is a widely different word, *shali*, which is probably but a common name for "corn." In Arabic the name is *shaer*, and in Turkish *arpa*, terms which have no connection with each other, or with those of any languages of Asia or Europe, and so we come to the conclusion that this corn is indigenous, or, at least, that its culture was not borrowed from strangers in the countries in which these languages are spoken.

We cannot determine the native country or primitive locality of the first culture of Rice to any particular Oriental region by philological evidence. This corn was unknown to the Greeks and Romans, at least as an object of cultivation, and has no original name in their languages. We may presume that it was equally unknown to the ancient Persians; for, had it been an object as well known to them as it now is to their descendants, it would hardly have failed to have attracted the notice, and to have been described by the Greeks, who had so much early intercourse with Persia. In Sanskrit the general name for Rice is *dhanva*, and in Hindi it is *dhan*, a mere abbreviation of the same word; in the Tamil the name is *shali*. In each of the monosyllabic languages which extend from Bengal eastward to China inclusive, Rice bears a different name. Thus we have it in the Peguan as *ha*, in

the Siamese as *kao*, in the Cambodian as *ang-ka*, and in the Anam, as *lua*. The many languages of the Malay and Philippine Archipelagoes are a signal exception to this diversity, for with them the general name is the same throughout, although the languages themselves often differ widely in words, in structure, and in sound. That name is *padi*, varied into *pari*, *pali*, *pasi*, and *vari*, according to national pronunciations, and it prevails not only from one extremity to the other of the two great archipelagoes, but extends even to the language of remote Madagascar. There is but one exception to this uniformity, and it is found in the recondite and dead language of Java, called the *Slawi*, which abounds in Sanskrit, and in which the term *dana*, an obvious corruption of the Sanskrit name already given.

The Persian name for rice is *shali*, which, as already stated, is that for it in the Tamil. This leads to the belief that the grain was most probably introduced into Persia from Southern India in the course of that maritime trade which is known to have been carried on for ages between the ports on the western coast of India, where the Tamil is the vernacular tongue, and those on the Persian Gulf. Had this cereal reached Persia from Northern India, its name, as in the case of wheat, would have been traceable to the Sanskrit, or one of its derivatives.

The name for rice in Arabic is *arus*, and this is obviously the source of the *arros* of the Spanish, the *rizo* of the Italian, the *riz* of the French, and the *rice* of the English,—the word increasing in corruption from Spain to Britain. It points to Spain as the country where the culture of this corn was first introduced into Europe by the Arabs. Rice, however, was known to the Greeks of the lower empire before the Arabian conquest of Spain; but they too must have learnt it from the Arabs, for the name they gave it, *aruza*, seems to be equally of Arabic origin as the names which it bears in the modern languages of Europe. The Arabic name itself may be supposed an original native word, and rice itself the indigenous plant of a country, the greater part of which is tropical, and therefore congenial to its growth. The vast importance attached to rice by those of whom it is the chief bread-corn, and perhaps also the tendency of the Oriental languages to run into verbal redundance, is strikingly exemplified in the case of this corn. Rice sports into far more varieties than any of the corns familiar to Europeans, for some varieties grow in the water and some on dry land; some come to maturity in three months, while others take some some four and six

months to do so. The Hindus, however, are not content with terms for such broad distinctions as might be derived from these obvious sources, but have names for varieties, the distinctions between which are unappreciable by Europeans. In the north-western provinces of India, no fewer than sixty-six of these names have been enumerated; and in Bengal, of which rice is nearly the sole bread-corn, the number is said to be still greater. But, besides terms for this corn, founded on variety, on season, and on mode of culture, the grain itself bears one name in the straw, another when threshed, one name when in the husk and another when freed from it, and a fifth when cooked. A similar redundance of terms is found in the languages of the Malay and Philippine Islands. Such minute nomenclatures seem to point to a great antiquity in the culture of this cereal with the people among whom they obtain.

Maize is, beyond all question, a native of America, and before the discovery of the New World was wholly unknown to the Old. The name as known to European nations is taken directly from the Spanish, and it is to be presumed that the conquerors of the New World borrowed it from one of the many languages of that continent. In some of the Oriental languages we have specific names for it, which seem entirely native,—such as *bhutta* in Hindi, *jagyng* in most of the languages of the Indian Archipelago, *katsalva* in the Madagascan. This would lead to the belief that the plant was indigenous where such names were given to it, but the probability is that they were taken from some native plant bearing a resemblance to maize. Thus, in the two principal languages of Southern India, maize is named after the chief millet cultivated in the peninsula, the *cholu* or *ragi* (*Cynosurus Coracanus*), to which an epithet implying its foreign origin is added. The Turks give it the name of *boghdai Misr*, or the wheat of Egypt, which is not more amiss than the names given by the French and English when they call it Indian and Turkey corn.

Philological evidence applied to plants yielding starch, or esculent farina, affords somewhat more satisfactory evidence than in the case of the cereals. One of the most important of the plants yielding this farina is the genus *Dioscorea*, in our language the Yam, and of which a dozen species, independent of varieties, have been enumerated. They are natives of Asia, Africa, and America, but of their tropical and sub-tropical parts only. The Spanish and Portuguese name of the

Dioscorea is *inhame*, from which comes the French *igname*, and from that, with Anglo-Saxon brevity, *yam*. I presume the Spanish name to be taken from some American language. In Hindi, the general name given to all esculent bulbs and roots is *alu*. This, Professor Wilson tells, us was the name given by those who spoke the Sanskrit language to a species of cultivated *Arum*, and not to the yam, with which, as an extratropical people, they must have been unacquainted The generic name, *alu*, with the prefixes *phul*, a flower, or *rath*, a chariot, are the names by which the Hindus of the north distinguish the yam. Not so, however, with the Hindus of the south, in whose country the yam is indigenous. As an example, it has in Tamil the specific native name *kalangku*.

Like the word *alu* of the northern Hindus, the word *ubi*, especially applied to the yam, is used generically for all esculent roots and bulbs by the Malayan nations. It is one of a very wide dissemination, for it prevails in not only all the many languages of the Malayan archipelago, but has been also extended to the Philippine tongues of a very different genius from the Malayan. It has done far more than this, for to the east it is found in the languages both of the lank-haired and woolly-haired races of the islands of the Pacific, while to the west it has reached as far as Madagascar. The original word is of such simple structure that it has undergone no other change than the substitution of one labial for another, or the elision of its single consonant. Among the insular languages there are but few exceptions to this general prevalence, but there are a few. In the principal language of the Philippines, and in the dialect of the Sandwich Islands, the only one of the Polynesian language beyond the northern tropic, we have native names for the yam. One species or other of the *Dioscorea* is, no doubt, indigenous in many of these islands of the Malay and Philippine archipelagoes, and in those of the Pacific. I saw myself wild yams dug up in the woods of an island off the Cape of Cambodia, which, probably from the frequency of the wild yam in it, takes its Malay name from it, for *Pulo-ubi*, the island in question, literally rendered, signifies "isle of Yams." No doubt it would be long used as food in its wild state by savage man, and it was probably first cultivated by a people who had made the first steps in progress, who would naturally give it its now wide-spread name. Who that people was, it is impossible to be sure of, but the Malays, or Javanese, as the most advanced and most enterprising, are the most probable.

The Sweet Potato, or tuber-yielding *Convolvulus*, appears to be a native of many parts of the tropical Old and New World. Some have alleged that it was first made an object of cultivation by the native Americans, but when the South Sea Islands, which had assuredly no communication with the American people, were discovered, the sweet potato was found to be in cultivation, and known by a native name throughout, the word being essentially the same, and a native one, varying only in pronunciation, as *kumava*, *humäa*, and *gumala* abbreviated *mala*. [*Kumara* or *umara*, of the South-Sea Islanders, is identical with *cumar*, the Quichua name for sweet potato in the highlands of Ecuador.—Ed.]

There is every appearance of the culture of the *batata* having been introduced into the islands of the Malay archipelago, and this by the Spaniards or Portuguese. In the Molucca Islands it accordingly goes under the name of *ubi kastela*, which signifies literally "the Castilian Yam," for the Moluccas had been temporarily under the rule of Spain, already in possession of the neighbouring Philippines. The Javanese, dropping the generic word, and eliding the sibilant in the word Castila, call the plant simply *catela*. The Javanese give it also the same name as the Spaniards, namely, *batata* or *patata*. The probability, then, that the Spaniards introduced the plant from the neighbouring Philippines, where it seems, if we are to trust the evidence of language, to have been cultivated by the natives when the Spaniards conquered them. I find the plant accordingly designated by native names in the two leading languages of these islands, the Tagala and Bisaya, in the first of which it is called *gabi*, and in the last *kamoti*,—a word, I may observe, adopted in Spanish dictionaries, and defined as the name of "a kind of sweet potato or *batata*." [*Camote* of the Spaniards is derived from the Aztec "camotl," used by the ancient Mexicans.—Ed.]

In Upper India the plant is clearly an exotic, and shown to be out of its genial climate by the production of poor and small tubers. The name given to it is *shakarcand*, a word half Persian and half Hindi, and both of which signify sugar. The Tamil name is the American *batata*, slightly corrupted into *vatata*.

The common Potato takes its name from the sweet one, for the latter seems to have been known, and even cultivated in the South of Spain before the first. Even at present, the name "potato" is given by the Anglo-Saxon Americans to the *Convolvulus Batatas*, while to the common

potato is given the epithet "Irish." At present, the Spaniards call the sweet potato *batata* or *batata de Malaga*, and the common potato *patata*, a mere change of one labial for another. The last is nearly our own name, and its source is therefore obvious. The original word is probably a native American one, but of what language I have not heard. The common potato had probably many native names, corresponding with the many tongues of America, for it was found by the discoverers cultivated both in North and South America. Whatever the origin of the name, the term is, at all events, better than the "earth-apple" of the French and Germans, or the "white truffle" of the Italians. In Hindustan, where the potato is now successfully cultivated, chiefly for European consumption, the name given to it is *balaiti alu*, or the "European esculent tuber." The Malays give it the name of *ubi Yuropa*, that is, the "European Yam," and the Javanese that of *kântang Holanda*, or "tubers of Holland," the *kântang* being the name of the *Ocymum tuberosum*, or tuber-yielding basil, a plant cultivated in Java for its tubers, which in flavour bear a considerable resemblance to those of the *Solanum*.

Sago, correctly sagu, is simply the name of the prepared pith of the palms which yield it, and has no reference to any particular palm, of which there are not fewer than five distinct species of the genus. The word, probably of the Malay language, is of universal use throughout the Malay and Philippine archipelagoes, and has long been adopted in the languages of Europe.

The Breadfruit (*Artocarpus incisa*) is known in the Malay archipelago (according to the language of the country) under the various names of *sukun*, *kluwi*, *kulor*, and *tambul*, but none of these are the names which it bears in the tropical islands of the Pacific; and hence we may conclude that the South-Sea Islanders are not indebted for it to the Malayan nations, as they are for some other cultivated products such as the Yam, the Cocoa-nut Palm, and the Sugar-cane. This is, indeed, what may be inferred, without the help of etymology, from the character of the plant, which is of the size of a forest tree, with perishable fruit, and consequently impossible of distant transport by a rude people. The plant is, no doubt, indigenous to the Pacific Islands, where alone it sports into several varieties, which have been reckoned as many as five [thirty, Ed.], a proof of long cultivation. Even the name given to the breadfruit is not universal in all the dialects of the Poly-

nesian language, for we have it in the Tonga as *me* and *marnai*, in the Tahiti as *vavo*, and in the Owyhee as *ulu*.

I shall conclude with a few general observations on the relative value of the plants enumerated by me, in so far as regards their influence on social progress. Of these, incomparably the most valuable to man are the cereals. They are the most agreeable and the most wholesome, while they contain the greatest amount of nutriment in the smallest bulk. Their culture, moreover, demands a greater amount of skill and labour than the lower kinds of bread; and this is a quality belonging to them which, as it stimulates industry and ingenuity, is, in a social view, of high value. It is useful that several of these cereals should be cultivated together, so that, in the event of the failure of one or two, there should remain others to fall back upon. It must be admitted, however, that, although the culture of several different cereals together may mitigate, it cannot prevent either dearths or famines, since the same drought or blight may, more or less, affect all of them. India, for example, in which a greater variety of cereals is cultivated than in Europe, has, nevertheless, been visited within the last hundred years with many dearths and several great famines, owing to the absence of the means of supplying the deficiency of one part of it by the superabundance of another. An easy and cheap intercourse between the different provinces of a country and its free commercial intercourse with foreign countries possessing climates different from its own, are the only certain guarantees against scarcities and famines. These conditions, however, can exist only in the most advanced states of society, and are wholly absent in the early and rude stages of it, to which the present discussion refers.

It may be safely asserted that no people ever attained a tolerable degree of civilization who did not cultivate one or other of the higher cereals. The architectural monuments and the letters of Egypt, of ancient Greece and of Italy, of Assyria, of Northern India, and of Northern China, were all produced by consumers of wheat. The monuments and letters of Southern India, of the Hindu-Chinese countries, of Southern China, of Java, and of Sumatra, were the products of a rice-cultivating and rice-consuming people. The architectural monuments of Mexico and Peru, and, we have no doubt, also of Palenque, were produced by the cultivators and consumers of maize.

No cultivators and consumers of roots or fruits, it may be safely

asserted, ever invented letters, or constructed a durable architecture. Among the Malays, whose bread is rice, the term "root-eater" is one of reproach, equivalent to savage. When the inhabitants of the celebrated Spice Islands were first seen by Europeans, their only bread was sago, or the pith of palms; and notwithstanding the possession, even the natural monopoly, of the then much-coveted clove and nutmeg, they were not only ignorant of letters, but had not even the rudest calendar. They had not even invented iron, which, together with their clothing, they received from strangers; and, but for the accident of their spices, they must have been downright savages, hardly on a level with the South-Sea Islanders. Had the bread of Britons some 2000 years ago been confined to the potato, Julius Cæsar would unquestionably have found our ancestors far greater barbarians than he describes them to have been, and they would surely not have encountered him with horses drawing armed chariots.

Perhaps the most advanced social position ever attained by men living on mere roots and fruits was that of the South-Sea Islanders. They cultivated no cereal, not even the humblest millet, but they were well supplied with farina-yielding plants—such as the yam, the sweet potato, the taro, and the breadfruit; still their advance was of the humblest, for they had not even invented pottery or textile fabrics, having nothing better than paper for raiment. [They had pottery.—Ed.]

It is possible for a people to attain a very respectable civilization when living on one of the chief cereals, although it be not the very highest. The mass of the Russians, and even of the Belgians, live on rye, and the mass of the people of Scotland on oats, although their condition would undoubtedly have been better had their bread been of wheat. The respectable amount of civilization which the Irish had attained after their conversion to Christianity, and which resulted in the adoption of foreign letters, and the construction of the round towers, was accomplished by growers and consumers of barley and oats. Had they been strangers to these, and their main food consisted, as it afterwards did, of a single root, their ancient civilization never could have existed: on the contrary, they would have been on a lower level than the South-Sea Islanders, who possessed a far greater variety of sustenance, with a more benignant climate.

But the potato is by no means the lowest quality of bread on which

a people can live and multiply. The lowest is that which is most easily produced, that is, which is produced with the smallest amount of skill and labour, and in this respect the banana is before the potato, and the sago perhaps even below the banana. The banana yields a crop in ten months from the time of planting, perpetuates itself by rattoons, and requires little care in its growth. Humboldt reckons that the produce of the same extent of land in bananas and wheat is in the proportion of 135 of banana to 1 of wheat, and that of the potato as 44 to 1. The sago-palm takes about ten years to yield its produce, but grows in a bog where nothing else will thrive, requires no care in culture, and, like the banana, propagates itself by shoots. Mr. Logan estimates the produce of the sago-palm, compared with wheat, as 163 to 1, and as compared to the potato, as 53 to 1. The quantity of nutriment contained in the banana and sago are by no means in proportions thus given, for we have to deduct the large proportion of water which they contain, and the absence in them of gluten, the most nutritious portion of the cerealia. Humboldt informs us that the Spanish settlers in America were so satisfied of the evil consequences of living on the banana that they frequently entertained the violent remedy of extirpating the plant, as the only cure for overcoming the apathy and idleness of those who made it their only bread—the Indians and half-breeds. The sago-feeders, however, are by no means so prepossessed in favour of sago, and never fail to prefer rice, or even the yam and sweet-potato, their consumption of it being a matter of necessity and not of choice.

A plain objection to root and similar crops, as compared to cereals, remains to be noticed. Root crops are, with few exceptions, incapable of being stored for a length of time, so that the superfluity of one harvest shall make up for deficiency of a future one. The potato lasts but for a year at best, and the tropical roots not much longer, while wheat, oats, and barley will keep for ten years; rice, in the husk, for fifty; while with the cereals there is far less difficulty in storing and transport.

Abstracts of the more important remaining papers will be given in the next number of the Journal.

NEW PUBLICATION.

Contributions towards a Cybele Hibernica, being Outlines of the Geographical Distribution of Plants in Ireland. By D. Moore, Ph.D., and A. G. More, F.L.S. Dublin: Hodges, Smith, and Co. London: Van Voorst. 8vo. Pp. 399.

This is a work the appearance of which will be welcomed by all who are interested in geographical botany. The distribution of species through Britain proper being ascertained and registered with greater detail and precision than has been anywhere else attained, it became a point of much interest to know clearly which of them reached Ireland, and how these were dispersed abroad over its surface. The published material for information was scattered and scanty. It is now thirty years since the issue of Mackay's 'Flora Hibernica,' and the work did not profess to do more for Ireland than the 'British Flora' did for Britain. There are in the whole island but two good and full local Floras, Dr. Power's 'Botanist's Guide for the County of Cork,' and Professor Dickie's 'Flora of Ulster, and Botanist's Guide through the North of Ireland,' and a few lists and records of excursions scattered amongst the periodicals and transactions of the Dublin Society and Botanical Society of Edinburgh. Dr. Moore and Mr. More have adopted the twelve provinces sketched out several years ago by Professor Babington, and have traced out the distribution of each species through these as well as they could by means of the published records, their own field observations, and the help of the few resident collectors scattered through the country, carefully sifting the list, rejecting many species and stations which rest upon doubtful or unconfirmed authority, and furnishing a classified list of special stations for all but the commonest plants. The work is in a conveniently portable form, and is illustrated by a coloured map of the twelve botanical provinces; and it is probable that we get a better book from both of them working in combination than either could have produced separately, or than could have been furnished by any one else.

The range of average temperature in Ireland does not differ materially from that of England. The isotherm of the Cork and Kerry coast is about the same as that of Helston and Ventnor, 52 degrees, and that of the north-east is from 47 to 48 degrees, the same as

the low country in the Tyne province and Yorkshire. The annual rainfall at Dublin is stated at twenty-six inches, that of the south-west at from forty to sixty inches; but it is probable that we derive a clearer idea of the climate in respect of the humidity of the atmosphere from the fact that there are upwards of 2000 square miles of peat-moss at a low level underlaid by limestone than from these last figures. The area of the whole island is 32,500 square miles, rather more than that of Scotland, and more than half that of England, of which a quarter is arable land, one-eighth peat-moss, and at least 1000 miles is occupied by lakes and rivers.

The physical geography of the island is very peculiar. The centre is occupied by a great plain underlaid by carboniferous limestone, a tract not far short of 20,000 square miles in area, three times the size of Wales, which stretches from Dublin to Galway, and from Armagh and Donegal in the north, to the borders of Cork and Waterford. The only material interruption to the continuity of this are two groups of hills, the Slieve Bloom and the Slieve Baughta, which rise from the two opposite sides of the Shannon near its mouth. Outside the plain there are four principal mountainous tracts, one in each of the four provinces. In Ulster nearly the whole province stretches beyond it; and in the mountains we have the three physico-geographical regions of Scotland represented in nearly equal proportions. Throughout Donegal, extending into Derry and Tyrone, is an outlying slice of the Scotch highlands, only a small part actual granite, the rest mica-slate, reaching an altitude of 2462 feet in Errigal. Between Lough Neagh and the coast through Derry and Antrim we have a prolongation of the trap hills of the Lothians, Fifeshire, and Clydesdale; and in the south a Silurian tract, representing the clay-slate region that stretches from the dales of the Tweed to the Mull of Galloway. The mountains of the Connaught coast are a prolongation still further west of the Donegal granite and mica-slate range. The highest peak in Mayo (Mwllrea) reaches 2682 feet, and the Connemara hills 2400 feet. In Leinster the range immediately adjoining the central plain is granite, rising in the Wicklow hills to 3000 feet; and between this and the sea the Silurian formation occupies a considerable space. From Waterford to the coast through the southern half of Munster stretches the finest mountain-chain of the island, a region of Devonian conglomerate and clay-slate like Cornwall and North Wales, filling up the entire

counties of Cork and Kerry, rising in Macgillicuddy's Reeks nearly to the height of Snowdon and Skiddaw, running out sharply in an abrupt and sterile ridge to the western coast, where Mount Brandon rises from the Atlantic seaboard to a height of 3126 feet. We shall not be far wrong if we estimate the central plain at 20,000 square miles, the Ulster tract outside it at 5000, and the other three mountainous regions regions roughly at 2000 square miles each.

Taking the number of species for Britain proper at Mr. Watson's estimate of 1425 species, our authors claim for Ireland about 1000. Of the 532 plants of the British type Ireland has all, or very nearly so. The Atlantic type is the only other one where she has decidedly more than half, forty-one species out of seventy. Of the Boreal species (Highland, Scottish, and Intermediate types taken together), although there is not a single one of the twelve provinces in which there is not a hill of upwards of 2000 feet in altitude, Ireland has only 106 species out of 238. Of the 458 English and local species she has just over one-half; and, finally, out of the 127 Germanic species only 18.

Doubtful species being left out, the number of species ascertained in Ireland, but not known in Britain proper, is reduced to twelve. Only five of these—*Saxifraga Geum*, *Erica mediterranea*, *Arbutus Unedo*, *Dabœcia polifolia*, and *Neotinea intacta*—are for Europe as a whole specially south-western in their distribution; whilst three—*Sisyrinchium anceps*, *Neottia gemmipara*, *Naias flexilis*, and, if we add the *Eriocaulon*, four—are North American plants not known on the European continent.

BOTANICAL NEWS.

The fifth part of Dr. Seemann's 'Flora of the Fiji Islands' has just been published. This completes the *Polypetalous* and *Monopetalous* Orders.

The 'Report of the Marlborough College Natural History Society for the half-year ending Midsummer, 1866,' has been issued, giving satisfactory proof of the activity of this young and flourishing Society. By the new plan of working by "sections," more real progress is made in natural history study than by the general meetings of the Society, at which only very elementary knowledge can be imparted, and all that is said must necessarily be couched in language as much as possible intelligible to the general audience.

'The Liverpool Naturalists' Journal' for June, July, August, and September (nos. i.–iv.), have come to hand. This Journal is published by Adam Holden, of Liverpool, in connection with the Liverpool Naturalists' Field Club, and is a

continuation and amplification, we presume, of the 'Naturalists' Scrap Book,' a lithographed journal mentioned by us from time to time, and devoted to local natural history. We wish this useful publication every success, and shall not fail to encourage it by presenting our readers with occasional extracts from it.

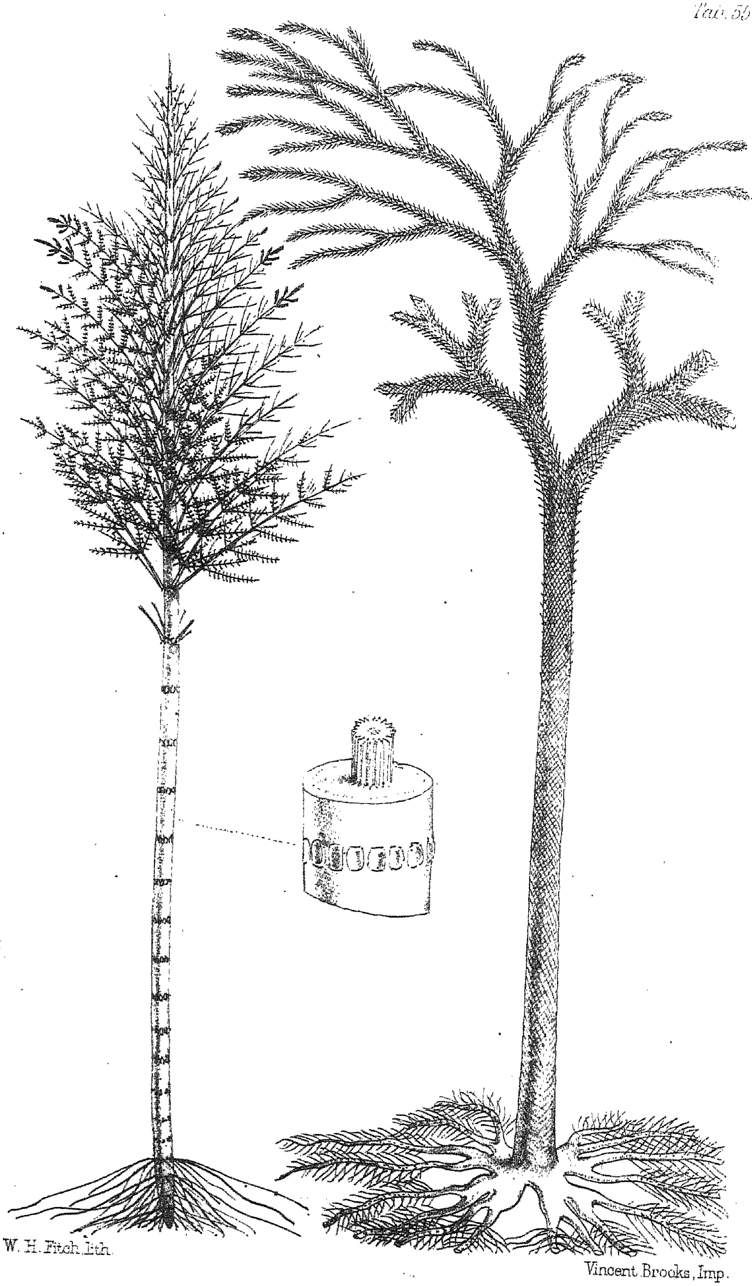
M. Casimir de Candolle has published, in the Transactions of the Geneva Natural History Society, a 'Mémoire sur la Famille des Pipéracées,' illustrated by figures, to which we should wish to direct attention.

The 'Botanical Results (*Botanische Ergebnisse*) of the Journey to Brazil of His Majesty the Emperor of Mexico, Maximilian I., during the years 1859–60,' by Dr. Heinrich Wawra, has just been published at Vienna. It forms a folio volume of 234 pages, accompanied by 104 lithographs, some of them coloured.

Mr. J. Smith's collection of Ferns, next to that of the late Sir W. J. Hooker's the most perfect and valuable in the world, has been bought by the British Museum. The same institution has also acquired the *Diatomaceæ* of the late Dr. Greville.

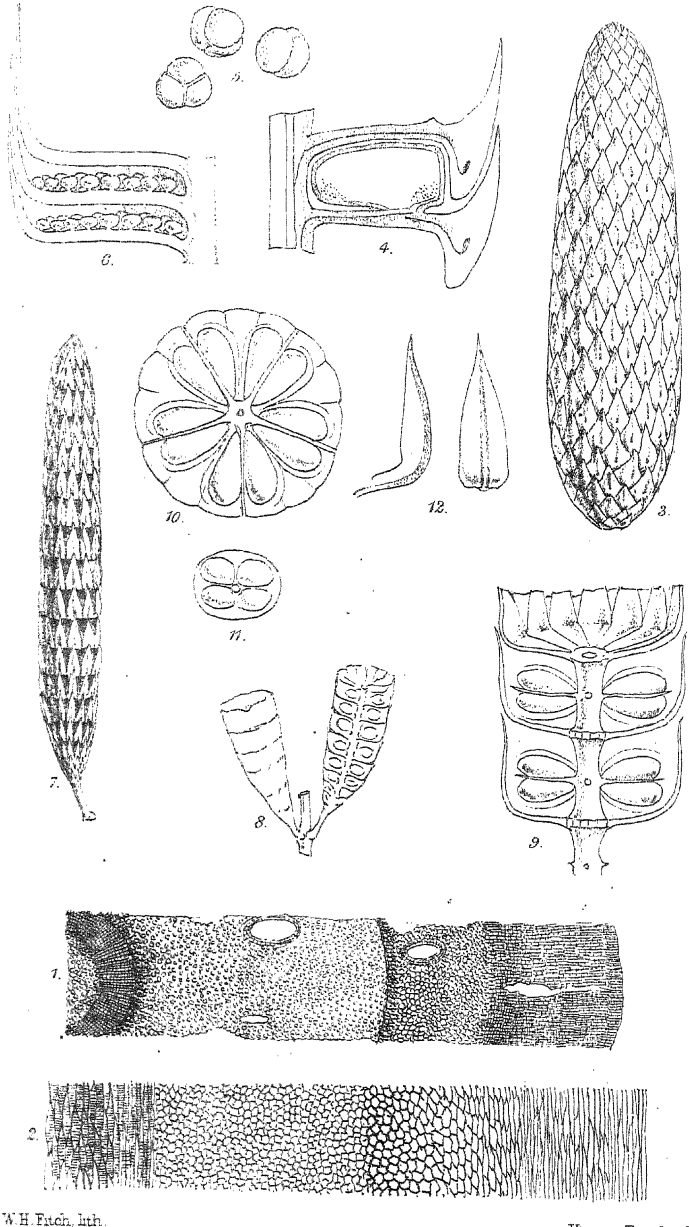
The twenty-seventh annual meeting of the Royal Botanic Society of London was held at the gardens, Regent's Park, Mr. B. Attwood being in the chair. The Report of the Council stated that the number of new Fellows elected during the year was larger than in that immediately preceding, and above the average of the past nine years. The total receipts of the year, including the balance brought forward, amounted to £10,476. 4*s*. 6*d*., and the payments to £8921. 15*s*. 10*d*., thus leaving a balance in hand of £1554. 8*s*. 8*d*. The gardens had been well attended during the year, amongst other visitors being many members of the Royal Family. The council had obtained a new lease from the Crown for thirty-one years, many new plants had been added to the collections, and others had flowered for the first time, especially the hardy Chinese Palm-tree, which bids fair to become a valuable addition to ornamental shrubberies in England. The attendance of medical students had been larger than usual, and the facilities afforded to lecturers, artists, and students was highly appreciated by them. The council and officers were re-elected.

The death of two eminent German botanists has to be recorded, Dr. Kotschy, of Vienna, and Dr. Mettenius, of Leipzig. Dr. Kotschy is well known as an Eastern explorer, and the author of a monograph of Oaks and several books of travel, containing much valuable information. Being a staunch Protestant, Dr. Kotschy's merit and European reputation were but tardily acknowledged in Roman Catholic Austria, and he died in but a subordinate position, being assistant at the Vienna Herbarium. Owing to the recent war in Germany, no obituary of him has as yet appeared, but the omission will probably soon be supplied. Dr. Mettenius died on the 18th of August at Leipzig, where he was Professor of Botany and Director of the Botanic Garden, a situation held formerly by the late Dr. Kunze, whose predilection for Ferns Dr. Mettenius shared. He was a son-in-law of Dr. Alexander Braun, and only forty-three years of age when his useful life came to a premature end.



W. H. Fitch, lith.

Vincent Brooks, Imp.



W. H. Fitch, lith.

Vincent Brooks, Imp.

ON THE STRUCTURE AND AFFINITIES OF LEPIDODENDRON AND CALAMITES.

By William Carruthers, F.L.S., Botanical Department, British Museum.

(Plates LV., LVI.)

The imperfect knowledge we have of fossil plants is the result of the fragmentary condition in which they occur. The deciduous leaves, ripe fruits, or broken branches that fell into streams, and were carried to sea or lake, had so many dangers to encounter, that only a very few of them ever reached the usual deposit where they would be preserved, and these few in such a decayed and fragmentary condition that it is often impossible to do more than make the most vague guesses at the nature of the vegetation to which they belonged. The occurrence of vegetable remains on the site where they grew, is extremely rare in all the formations which form the crust of the earth, except in the coal-measures. The plants of this period might therefore be expected to be well known, especially as the beds containing vegetable remains, of carboniferous age, have been more exposed, because of their economic value, than those of any, or indeed of all the other formations put together. The peculiar nature of the vegetation, and perhaps the extreme humidity of the atmosphere, and the swampy localities in which the plants grew, have made the superabundant mass of vegetable remains as great a mystery as the scanty and fragmentary fossil plants of other periods. Except in the thin films of charcoal which occur in most coals, traces of structure are scarcely to be found in the coal itself, so thoroughly has the vegetable matter been converted into amorphous pulp before mineralization took place, or so completely has it been metamorphosed subsequent to deposition. The plants themselves have all been so brittle, that when portions are preserved, as they are in immense quantity, especially in the roof shales, they are so fragmentary, that it is difficult to determine the various portions that belong to the same plant. The root is rarely connected with the stem, the stem with the branches, or the branches with the leaves or the fruit. As a result, all these parts have been often referred to different genera, and have received different names. With additional observations, the means are, however, occasionally turning up, which enable us to reduce some of these genera, the

establishment of which was absolutely necessary in the earlier days of palæontological botany. Thus, to give an example:—the trees belonging to the same set as those which were found imbedded in the sandstones at Craigleith quarries have been constituted into the genus *Dadoxylon*; the pith forms the genus *Sternbergia*, and some fluted and constricted specimens have been referred to *Calamites*. The leaves were considered to be ferns, and named *Cyclopteris*; and the fruit was thought to belong to a Palm, and received the name of *Trigonocarpon*. We have not seen evidence sufficient to convince us that all these are correctly referred to the same plant; but this is the opinion of some distinguished palæontologists, and it serves as a good illustration of the present satisfactory tendency of palæontological botany.

A similar multiplication of generic names encumbers the synonymy of the two genera *Lepidodendron* and *Calamites*.

Lepidodendron was a branching tree of considerable size. It is separated from the other genera of coal plants by the form and arrangement of the leaf-scars upon its stem. More than forty species have been recorded; but as the scars present different appearances on different portions of the same plant, no doubt more species have been established than the materials fairly warrant. But that they were numerous in species, and very numerous in individuals, any one who has even cursorily examined a coal-pit, or the fossils in any public museum, must be convinced. They certainly contributed largely to the formation of coal.

The researches of Witham,* Lindley and Hutton,† Brongniart‡ and Binney,§ have made us acquainted with the stem. These published

* 'The Internal Structure of Fossil Vegetables,' 1833.

† 'The Fossil Flora of Great Britain,' 1831–1837.

‡ 'Observations sur la Structure intérieure du Sigillaria elegans, etc.'—*Archives du Muséum*, 1839.

§ 'Geological Society's Journal,' 1862, and 'Philosophical Transactions,' 1865. Mr. Binney, in these papers, gives most careful and elaborate drawings and descriptions of some fossils in his extensive collection. He refers them to the genus *Sigillaria*, because of their agreement in internal structure with Brongniart's *S. elegans*; but he cannot separate them by their external markings from *Lepidodendron selaginoides*, Lindl. and Hutt.; and as the only characters by which the two genera are distinguished are derived from the markings on the stem, we must consider *Sigillaria vascularis* as a true *Lepidodendron*. I am the more satisfied as to this, because I believe no essential difference exists, as has been hitherto maintained, between the stems of *Sigillaria* and *Lepidodendron*, or any of the other lepidodendroid plants of the coal period. I cannot enter into this question here, but I shall take an early opportunity of publishing my views, and the reasons for maintaining them.

observations, together with the examination of some beautiful specimens in the collections of Robert Brown, now in the botanical department of the British Museum, and of Mr. Alexander Bryson, enable me to give a somewhat complete description of its singular structure.

The axis of the stem cannot be considered as a true medulla or pith, inasmuch as it is composed not of simple cells, but of elongated utricles of various sizes, irregularly arranged, and having thin walls marked with scalariform bars (t. 56, f. 2). These utricles, indeed, differ from the vascular tissue of the woody cylinder which surrounds them only in their length. The tissue of the woody cylinder consists of long scalariform vessels, which increase in size from the inner margin to the outer, this increase being sufficient to meet the requirements of the enlarged circumference, with the help of only a few additional series of vessels. As there is no true medullary cellular tissue in the axis, so there are no medullary rays passing through this cylinder. In radial sections an appearance is seen singularly resembling, to the naked eye, the "silver grain" produced in dicotyledonous woods by the medullary rays; but this arises from a very different cause. The diameter of the vessels is so great, that on a polished surface only the scalariform wall of the vessel, that lies on or near the surface, is exhibited; and when the upper wall of a vessel is cut away, the lower wall is often so deeply buried in the opaque substance, that the peculiar structure is obscured. In the case of sections prepared for microscopic examination, both surfaces of some vessels are often removed, and the scalariform markings on the lateral walls, or on any horizontal walls which by chance occupy a medial position between the polished surfaces, only are seen. This absence of the scalariform bars gives at first sight the appearance produced by medullary rays.

The continuous cylinder of scalariform vascular tissue appears to be penetrated by the vascular bundles which ultimately supply the leaves. These bundles apparently originate either in the scalariform tissue of the axis, or on the inner surface of the woody cylinder. They have been mistaken for, or misnamed, medullary rays.

The woody cylinder is surrounded by a great thickness of cellular tissue, which extends to the exterior of the stem, and is composed of three distinct and separable zones. The inner zone has never, as far as I know, been perfectly preserved in any specimen, yet traces of it sometimes may be seen; and it is rightly restored in Brongniart's

drawing of *Lepidodendron Harcourtii*, in the 'Archives du Muséum,' vol. i. plate 31. Its absence in fossils is owing to its extremely delicate structure. The cells of the middle zone have thicker walls, and they have consequently frequently resisted decomposition before fossilization made them permanent. In the outer zones the cells are very much lengthened, and have a smaller diameter. They nearly resemble true vascular tissue; but the progress of lengthening may easily be traced from the interior outwards, and no distinction can be drawn between the true cells, and the long and slender ones of the outer circumference. The cell-walls of all the three zones are without markings of any kind.

These three cellular zones are traversed by the vascular bundles which rise from the outside of the interior woody cylinder, if they do not actually pass through it, and pass to the leaves and branches. These bundles separate from the woody cylinder a long way below the point where they pass off into the leaf. At first their direction is almost parallel with the cylinder, slightly inclining outwards; they then incline more outwards, and as they approach the circumference of the stem, they resume their nearly ascending direction for some distance, until they finally pass out to the leaves which they support. Each bundle consists of scalariform vessels, very much finer than those of the woody cylinder, surrounded by elongated cells like those of the outer zone, and probably still further enclosed by a delicate parenchyma, which disappeared before it could be fossilized. The only evidence I have of the existence of this cellular tissue is, that the bundles never fill the cavities in the parenchyma of the stem through which they pass. The bundles terminate in the points seen on the areoles of the stem, which are the scars of the leaves.

The woody cylinder is of different thicknesses in different stems, and appears to have increased with the growth of the tree. There is, however, no indication of interruption in the growth or of seasonal layers. Yet it cannot be conceived that the whole vascular cylinder arose and was developed at the same time. It is very probable that the zone of slender, and consequently rarely preserved cellular tissue which surrounded the woody cylinder, was analogous in its functions to the cambium layer of phanerogamous stems, like the similar layers in recent *Lycopodiaceæ*, described by Spring in his 'Monographie de la Famille des Lycopodiacées" (page 294).

If we separate the different structures we have described in the axis into two series, the one series axial, and the other epidermal, we shall have the axis composed of scalariform utricles, the woody cylinder and the vascular bundles passing to the leaves belonging to the first series, and the two external zones of the vascular tissue to the second. The inner zone of cellular tissue, like the cambium layer, was most probably common to both series, the cells of the outer circumference being developed into the parenchyma of the epidermal series, while the vessels of the woody axis were produced from the cells of the inner series.

Stigmarioid roots have been determined to belong to *Lepidodendron* as well as to *Sigillaria*, and their whole structure supports this determination. I have satisfied myself that there is nothing that can be truly called a medullary ray in the woody cylinder of *Stigmaria*, but into the proof of this I will not now stay to enter. The base of the trunk was divided into a few principal roots, and these again divided dichotomously, but the ultimate divisions were never much attenuated. Throughout their whole course, and from every portion of their circumference, they gave off rootlets of considerable length, which, with the exception of a slender vascular bundle, were entirely composed of delicate hexagonal cells. They were articulated to flagon-shaped bodies sunk in cavities, arranged in a quincuncial manner over the stem. The internal structure of the *Stigmaria* root corresponds to that of the trunk of *Lepidodendron*. The axis was composed of fusiform barred cells, and this was surrounded by a woody cylinder, which was certainly penetrated by the vascular bundles that supported the rootlets. Beyond the woody cylinder came a great thickness of cellular tissue, almost always destroyed, but probably agreeing in its structure with the three zones of the stem.

In speculating upon the conditions under which the forests of *Lepidodendron* flourished, it is most important to observe whatever is peculiar in those organs by which the plants were connected with the physical conditions around them. Geologists have too much overlooked such considerations in their deductions as to the physical phenomena of a period from the plants and animals that then existed. They have often taken for granted that the known conditions of the living species of a genus are true also of the fossil members of the same genus. In the want of other evidence, such an assumption may be cautiously employed; but unless its true value be accurately estimated,

the greatest errors may arise, as they have in the past. For example, the systematic position of *Elephas primigenius* having been clearly established, the inference was thought legitimate that, as the modern representatives of the genus were confined to tropical or subtropical countries, the boreal regions must have enjoyed a similar climate when they were inhabited by these ancient elephants. It was, however, discovered that their skin was clothed with wool and long hair, and that, consequently, they were adapted to endure a cold climate. In plants, the structure of the fruit would in most cases teach nothing as to the temperature and humidity of the atmosphere in which, or the kind of soil upon which, the organism grew, though it would be of the first importance in determining systematic position. On the other hand, the root, the leaves, and the tissues of the plant, would be of only secondary importance in regard to systematic position, but of the highest value in determining physical condition. In regard to *Lepidodendron*, its singular roots would seem to imply that it derived a large amount of moisture through them from a moist soil, and so far differed from most living cryptogamia, which obtain it mostly from the atmosphere. The roots of this genus presented in their crowded and long rootlets an immense surface for the absorption of moisture; and in their great abundance of lax cellular tissue possessed the means of containing this moisture, and transmitting it to the foliage.

The leaves of *Lepidodendron* were simple, lanceolate, acute, and sessile. They had a single medial nerve. The younger branches were densely covered with leaves; and the scars left on the trunk after they perished, give the numerous beautiful markings by which the species have been distinguished. The leaves when found separated from the branches, are called *Lepidophylla*.

The fruit was a strobilus (t. 56, f. 3), formed from a shortened branch, the leaves of which are converted into scales, that support on their upper surface a single large sporangium (*Lepidostrobus*, t. 56, f. 4), or perhaps several small ones (*Flemingites*, t. 56, f. 6). There appear to be both macrospores (t. 56, f. 5) and microspores in the same sporangium. I have examined at length the structure and affinities of these fruits, in a paper published in the 'Geological Magazine,' vol. ii. p. 433, to which I must refer, without here dwelling further on the subject. *Flemingites*, although the sporangia are enormously abundant in some coals, have not yet been found connected with any

fossil; but specimens of *Lepidostrobus*, attached to branches of *Lepidodendron*, have been described by Dr. Paterson, Brongniart, and others; and I have noticed a fine specimen in the Museum of the Edinburgh Botanic Gardens, and others exist in the collections at the British Museum and elsewhere.

In tracing the affinities of *Lepidodendron*, we have the safest guide in the organs of fructification, and fortunately these have been satisfactorily determined. The sporiferous strobilus shows that it is a true cryptogam; and in general appearance and arrangement of parts, the strobilus can scarcely be distinguished from that of some living *Lycopodia*, except in the great difference of size; this affinity is strengthened by the character of the leaves, and the structure of the stem. But the possession of both kinds of spores in the same sporangium exhibits stronger affinity to *Rhizocarpeæ* than to *Lycopodiaceæ*.

The structure of the arboreal stem of *Lepidodendron* is much more complex than that of any known cryptogam. The central axis of irregularly-arranged vascular tissue in *Lycopodium* is suited to the low stature of the plants of that genus; but in the giant *Lepidodendron* there is a complexity, which approaches the structure of some dicotyledonous stems. The general arrangement of the tissues, resembling what exists in some *Cycadeæ* and *Cactaceæ*, has caused this fossil plant to be referred sometimes to the one, and sometimes to the other of these Orders; but the resemblance is only one of analogy, and not of affinity. The presence of scalariform tissue, of which the woody portion is entirely composed, and the absence of medullary rays, would, even if the fruit were unknown, be sufficient to establish the cryptogamic nature of the plant. A comparison with the Cycadean stem may help us, by the resemblances and differences which will appear, better to understand the stem of *Lepidodendron*. The Cycads have all a large medulla, composed of large-sized parenchyma; in some genera traversed by numerous vascular bundles, as in *Encephalartus*, and in others entirely cellular, as in *Cycas* and *Zamia*. This is surrounded by a single woody cylinder, or several, everywhere penetrated with medullary rays. Beyond this there is a considerable thickness of parenchyma, composed, in their inner portion, of cells whose length exceeds only slightly their breadth; these gradually lengthen, until they assume an appearance very like the external portion of *Lepidodendron*. This cortical parenchyma is traversed by the vascular

bundles which supply the leaves. The two stems are evidently built upon the same plan; and were we to substitute scalariform tissue for the gymnospermatous woody tissue, and scalariform utricles for true medullary parenchyma, and finally exclude the medullary rays, the description of the Cycadean stem would apply to that of *Lepidodendron*. And it deserves special notice, that the surface of the Cycadean trunk is composed of the bases of the old leaves, together with the scales which in some species are interspersed among them, or alternate with them. The leaves do not disarticulate at the circumference of the stem, but at some distance from it, leaving a small portion of the base persistent. The scars of the outer surface of the stem give a different impression from those presented when the persistent bases of the leaf-stalks are removed. Whoever is even a little familiar with coal fossils is aware that there are two sets of scars on the stems of *Lepidodendron*—one superficial, the other internal. The fossils that present the first set are generally said to be "corticated" stems, and those exhibiting the others "decorticated." The "bark" is generally converted into a compact structureless coal, the outer surface of which has the one set of scars, and the inner surface the other. I believe this coal is produced by the external of the two epidermal series, and that the outer scars were truly superficial, while the inner were produced by the vessels which passed to the bases of the leaves. The two sets of scars in Cycadean stems are analogous structures; but in *Lepidodendron*, the layer which bears the scars on its two surfaces is a compact cylinder; while in the *Cycadeæ* there is no connecting tissue uniting the bases of the leaves; they are closely packed together, but quite free from each other. It is evident that in many respects the fossil stem had a striking analogy in the arrangement of its parts to that of the recent Cycads, while it was, however, a true Cryptogam; and if we now examine the slender stem of *Lycopodium* we shall find, I believe, that *Lepidodendron*, though more highly developed, does not differ essentially from it.

Spring, in his 'Monographie des Lycopodiacées' (p. 293), describes the stem of this Order as composed of five parts:—1st. The woody axis; 2nd. A layer of delicate cells; 3rd. The liber; 4th. The herbaceous envelope; and, 5th. The epidermis.

The axis is composed of bundles of scalariform vessels, scattered through a very delicate cellular tissue, in a regular figure, which varies

in the different species. This axis is surrounded by a layer of lax, delicate, cellular tissue, which Spring considers to be the channel through which the sap circulates, and the seat of growth in the stem, —the inner portion being developed into wood vessels, and the outer into "liber." The "liber" is composed of elongated cells, with thickened walls. Spring gives to it this name because of its analogy to the liber in dicotyledons. This layer is often so thin that it is difficult to detect. It is surrounded by a thick greenish layer, composed of large elongated cells, with thin walls; and this is covered with an epidermis, consisting of small cells with thick walls. The vascular bundles pass through the various layers of cellular tissue from the axis to the circumference.

The great difference between the stem of *Lepidodendron* and *Lycopodium* is the existence of a pseudo-medulla, and the arrangement of the vascular tissue as a solid cylinder in the fossil genus, compared with the central position and loose structure of the vascular tissue in the recent plant. In both the recent and fossil stems, the vascular tissues are surrounded by a zone of thin-walled cells, which has disappeared in all the dried specimens of *Lycopodium* I have examined, leaving the axis free, and which, as we have seen, is very rarely preserved in *Lepidodendron*.

Calamites.—Few fossils have been more misunderstood than the set of plants to which the name *Calamites* is given. One of the least errors regarding them was that which placed the stem upside down, and made the cylindrical roots its leaves. *Calamites* is rarely preserved so as to exhibit structure, being almost always converted into amorphous coal, and exhibiting an apparently furrowed and jointed stem, somewhat resembling the recent *Equisetaceæ*. The few specimens that have been found with the internal organization of the stems preserved, show a structure different from what had been assumed to be that of *Calamites*, and have been constituted into the genus *Calamodendron*. Like *Lepidodendron*, *Calamites* must have been a very brittle plant, as its remains occur in such a fragmentary condition, that great difficulty has been experienced in determining the different parts of the plant. The branchlets and foliage have been referred to the genus *Asterophyllites*, supposed to be independent aquatic plants, and the fruits form the genus *Volkmannia*.

The stem of *Calamites* was formed on a different plan from that of

Lepidodendron. Mr. Binney is at present engaged in preparing an account of its internal structure, with copious illustrations, which will be more complete than any hitherto published, because of the abundance of well-preserved specimens contained in his cabinet, the result of so many years' devotion to the study of the fossils of the coal measures. I shall therefore content myself with a hasty sketch of the genus. The specimens hitherto figured by Petzholdt, Corda, Gœppert, Sternberg, Unger, and others, have generally wanted the cellular tissue of the axis and of the epidermis. The specimens which Mr. Binney has shown me exhibit, as I believe, the whole structure from the centre to the circumference. The axis (t. 55) consists of a considerable mass of cellular tissue without any vascular bundles penetrating it. This is surrounded by a solid cylinder of wood, formed entirely of scalariform vessels, and without (in all the specimens I have examined) any trace of medullary rays. The vascular tissue was developed from a series of equidistant points near the circumference of the cellular tissue, and grew outwards and laterally until they united in a continuous cylinder, fluted on the inner surface, and with the flutings filled with the cellular tissue of the axis. The early vascular bundles in the young stems of exogenous plants have a similar origin, but they speedily unite to form a woody cylinder, with a clearly defined and smooth inner surface towards the pith. This early condition is permanent in the stem of some arborescent species of *Cactus*, which, in this respect, closely resembles *Calamites*; but it is only a similarity in the arrangement of the parts, without any true affinity, for the stems differ as much as *Lepidodendron* does from *Cycas*. The woody cylinder formed constrictions at regular intervals round the cellular axis, as in some recent *Artocarpeæ*. Beyond the woody cylinder there was a thin epidermal layer of parenchyma, which is less seldom preserved than even that of the interior.

The flutings and constrictions of the stem described as external were on the interior of the woody cylinder. The parenchyma having generally disappeared in fossilization, the wood alone formed the thin layer of coal that is generally all that remains to indicate the existence of the fossil. This is always furrowed longitudinally, and barred at intervals, apparently externally; but the examination of specimens, in which the structure is preserved, show that there was no fluting on the outer surface. Richter and Unger, in their 'Palæontologie des

Thüringer Waldes' (Vienna, 1856), have restored the stem of a *Calamites* with a thick epidermal cellular layer, and this they have furrowed on its outer surface; but as this layer was so perishable that it has almost invariably disappeared, it could not have produced the furrows which occur in almost every specimen. When the stems were thrown down, the cellular portions were generally completely decayed, and the space occupied by the axis was filled with the clay or sand in which the plant finally rested. In this way a cast of the interior was made, which in time became harder than the vascular tissue of the stem, and the pressure of the superincumbent deposits flattened and compressed the woody cylinder, producing on its upper surface a counterpart of the internal cast, with its furrows and constrictions. The furrows vary in size and closeness in different specimens, and produce indications sufficient to account for the different species that have been established.

The stem somewhat rapidly contracted at the base, the nodes shortening and giving off long cylindrical roots which spread laterally through the soil.

The main stem was simple, but at intervals gave off whorls of slender branches, and these again bore branches or leaves also arranged in whorls. The leaves were linear-acuminate, and each whorl contained from ten to twenty leaves.

The fruit (t. 56, f. 7) was composed of whorls of scales alternating with, and protecting whorls of sporangium-bearing spines (t. 56, f. 9). It was borne either at the termination of the primary branches or in whorls around them, and was composed of a shortened axis, with the leaves specially developed. The strobilus described by Ludwig (Meyer's 'Palæontographica,' vol. x. p. 11, t. 2), consists of from twenty to twenty-five series of barren protecting scales, arranged fifteen in a whorl, the scales of each whorl being opposite to those in the others. Between the scales is a whorl of five short spines, each supporting four flask-shaped sporangia. The spines of one series are arranged opposite to the spines of the other, that is to say, they are arranged perpendicularly on the axis, the one directly over the other. I have confirmed these observations on specimens of the fruits found in Britain, belonging to Dr. Hooker, and made some important additional observations on the structure of the strobilus and the contents of the sporangia, which I hope soon to publish.

It is not easy to find anything analogous to *Calamites* among recent

plants. Nevertheless, its structure does not differ so essentially from the vascular cryptogams as to cause any uncertainty as to its position. The histological character of its wood, the absence of medullary rays, and the nature of its fruit, clearly establish that it was a true cryptogam; and while it differed in the arrangement of the parts of its stem in its foliar appendages, and in its organs of fructification from *Lepidodendron*, yet it is evident these were both near allies, and both more highly organized than any of their living representatives.

Explanation of Plates LV. and LVI.

Plate LV.—Restoration of *Lepidodendron* and *Calamites;* and section of stem of *Calamites*, showing the position of the flutings. (The axis is drawn too slender in proportion to the thickness of woody cylinder.)

Plate LVI.—Figs. 1–5. *Lepidodendron.*—1. Transverse section of the half diameter. 2. Longitudinal section of ditto. 3. Strobilus. 4. Scale and sporangium. (The vascular bundle should be produced to the apex of the scale.) 5. Spores. Fig. 6. Scale of *Flemingites*. Figs. 7–12. *Calamites* (after Ludwig). 7. Strobilus. 8. Part of a whorl of strobili. 9. Longitudinal section of two cells of a strobilus. 10. Transverse section of one cell. 11. Apex of a spine with its four sporangia. 12. Scales from strobilus.

CORRECTIONS IN THE SHETLAND FLORA.

By Hewett C. Watson, Esq.

Mr. Ralph Tate has done good service to local Botany by publishing an amended list of the plants of the Shetland Isles in the 'Journal of Botany' for January last, No. 37, pp. 2–15. I am told that a full set of his collected plants is placed in the British Museum. Through the good offices of the Rev. W. W. Newbould another set, less complete, has been added to my own stores. It seems desirable to correct some errors of nomenclature, made evident by the labels which came with my set of the specimens, and partly affecting the accuracy of the printed list of these plants.

At the same time, I wish also to point out and correct a remarkable mistake in geographic botany, which is unfortunately set forth in the paper by Mr. Tate in a manner too likely to puzzle and mislead his readers. Following the six zones of distribution explained in the 'Cybele Britannica,' the two lowest are not represented at all in this northerly group of islets. But it is stated in the paper of Mr. Tate that the four other zones are all represented there, and all within a

vertical range of a thousand feet or less! If true, this would be a noteworthy fact, inasmuch as the two intermediate zones of the four include a vertical range of 1700 or 1800 feet on the mainland of Scotland; so that quite 2000 feet is there required to represent all four, the lower and upper very partially.

The cultivation of grain being carried on in Shetland, its lower levels are within the Super-Agrarian zone, which Mr. Tate limits to "an average elevation of 100 feet." He informs us that the two next zones, "the Infer- and Mid-Arctic," are "not clearly separable, the Infer-Arctic extending to at least 600 feet." And he further states that the "Super-Arctic zone commences at an elevation of 800 feet on Ronas Hill, and its flora is represented by *Azalea procumbens*, *Carex rigida*, *Saussurea alpina*, *Alchemilla alpina*, *Salix herbacea*, *Sibbaldia procumbens*."

It is very evident from these intimations that Mr. Tate has misunderstood the zonal subdivisions of the Arctic or Alpine region in Scotland. That which he mistakenly designates the Super-Arctic Zone is truly the lower portion of the Mid-Arctic Zone. But, having thus jumped at once from the Infer-Arctic to the so-called Super-Arctic Zone, he is, of course, unable to find any Mid-Arctic Zone between them, and so fancies it somehow lost, or "not clearly separable from" the lower zone.

There is truly not the slightest indication of the Super-Arctic Zone in Shetland, either in the altitude of its hills or by the existence of any exclusively Super-Arctic species. Not one of the half-dozen plants specially enumerated is peculiar to the highest zone, nor is there any one in his printed list which is so. The *Alchemilla alpina* is found in the Super-Agrarian Zone of Scotland; that is, it descends below the lowest of the three Arctic zones. The *Sibbaldia* and *Saussurea* both descend into the Infer-Arctic Zone. The three other species all occur low in the Mid-Arctic Zone, being more especially the species which usually indicate the transition from the Infer-Arctic to the Mid-Arctic Zone of plants. Shetland has really three of the six zones only, which may be thus indicated:—

2. Super-Agrarian Zone, extending from the shores to the upper limit of grain-cultivation.

4. Infer-Arctic Zone, the space above cultivation, and below the appearance of the true Mid-Arctic species, next mentioned.

5. Mid-Arctic Zone, at an elevation where *Azalea procumbens*, *Salix herbacea*, and *Carex rigida* are found.

Next, as to the errors of nomenclature. Not having seen the set of specimens in the British Museum, I can only suggest that some competent botanist there should ascertain how the facts stand, and correct accordingly. Mr. Tate informs us that he was only four weeks in Shetland, and that botanical investigation was unavoidably a secondary object. Under such circumstances, it was not to be expected that his collections could be ample, or the specimens always in their best state. The species in my set of them are mostly represented by a single small plant or fragment, or even by a leaf or two without flowers or fruit; so that positive determination is not always facile, if possible, and some of my corrections must accordingly be here made only suggestively. The first name given is that of Mr. Tate's label, the suggested correction follows.

1. *Ranunculus repens*, Bressa.—This is a very pubescent state of *R. acris*. (But true *R. repens* is likewise in the collection, labelled from Out Skerries, collected by Mr. Peach.)
2. *Viola Riviniana*, Buness, Unst.—Apparently *V. flavicornis*, of Smith, which is a small state of the species described as *V. canina* in Babington's 'Manual.' (In England, *V. Riviniana* is much the more frequent of the two other subspecies now jointly named *V. sylvatica*, and quite distinct from the *V. canina* of Bab. Man.)
3. *Cerastium viscosum*, Burravoe, Yell, and Haroldswick, Unst.—Both are *C. vulgatum*, otherwise known as *C. glomeratum*. (The true *C. viscosum*, otherwise named *C. triviale*, is also in the collection, labelled from Lerwick.)
4. *Rosa canina*, var., Burrafirth, Unst.—No flowers or fruit on this scrap, the pubescent leaves of which look more like those of *R. villosa*, or some other of the *R. mollis* group.
5. *Gnaphalium norvegicum*, Burrafirth.—This is *G. sylvaticum* in its ordinary form, except in being very short or dwarfed, as is the case with most of the other plants.
6. *Hieracium crocatum*, Burrafirth.—Not so; being one of the phyllopodous group. I hesitate to name a single weakly specimen in this difficult genus.
7. *Myosotis collina* and *M. versicolor*, both from Haroldswick, and both labelled interrogatively. The larger example is *M. arvensis*, the smaller one may be *M. versicolor*.

8. *Salix cinerea* and *S. aurita*, Loch of Cliff, Unst.—Leaves only. Slightly different, but both perhaps belonging to *S. aurita*.
9. *Festuca* ?, Walls, Buness, Unst.—Probably *F. ovina*. Two specimens, one of them having pubescent glumes.
10. *Arrhenatherum avenaceum*, Burrafirth.—Certainly *Avena pubescens*, which is not in the printed list.
11. *Equisetum fluviatile*, Burrafirth.—Certainly *E. palustre*. But *E. limosum* (that is, the unbranched state of *E. fluviatile*, L.), is also in the collection, rightly named, and is enumerated in the printed list, as well as *E. palustre*.

[Having, with the help of the Rev. W. W. Newbould, examined the plants mentioned by Mr. Watson, in the set communicated by Mr. Tate to the herbarium of the British Museum, we find that, at least in some cases, different plants must have been sent to Mr. Watson from those deposited in the Museum. The following is the result of our examination :—

1. *Ranunculus repens*, Bressa; 2. *Viola Riviniana*, Buness, Unst; and 11. *Equisetum fluviatile*, Burrafirth, are the correct names of the specimens in the Museum.

3. *Cerastium viscosum*.—The plant from Burravoe is not in the Museum; that from Haroldswick is *C. glomeratum;* and *C. triviale*, Lerwick, is rightly named. There is another specimen of *C. triviale* from Skaa, Unst.

4. *Rosa canina*.—The Museum specimen is certainly different from Mr. Watson's, and there seems no reason why it may not be this species.

5. *Gnaphalium norvegicum*, Burrafirth.—Mr. Watson's correction applies to the Museum specimen.

6. *Hieracium crocatum* is not in the Museum.

7. Neither of the plants from Haroldswick are in the Museum. There is a specimen named *Myosotis collina* from Buness which may be *M. versicolor*.

9. A *Festuca* from Buness is rightly named in Mr. Tate's label *F. ovina*.

10. The Museum specimen, like Mr. Watson's, is *Avena pubescens*. —W. C.]

REVISION OF THE NATURAL ORDER *HEDERACEÆ*.

By Berthold Seemann, Ph.D., F.L.S.

(*Continued from Vol. III. p.* 299.)

XIII. On the Genus Raukana.

XXXI. Raukana, gen. nov.—Pedicelli inarticulati. Flores ecalyculati, hermaphroditi. Calyx tubo obconico, limbo 5-dentato. Petala 5, ovata, æstivatione valvata. Stamina 5. Ovarium 2- per excessum 3-loculare, loculis 1-ovulatis. Styli 2–3, basi connati, apice recurvi, intus stigmatosi. Drupa ovata, subcompressa v. 5-angulata, 2–3-locularis, loculis 1-spermis. Albumen . . . . .—Arbor Novæ-Zelandiæ, 20–40-pedalis; foliis exstipulatis, oppositis v. alternis, 1- v. 3-foliolatis, foliolis oblongis v. lineari-lanceolatis integerrimus v. pinnatifidis, membranaceis lucidis; umbellis terminalibus v. axillaribus, involucratis.

1. *R. Edgerleyi*, Seem.—*Panax Edgerleyi*, Hook. fil. Fl. N. Zeal. i. 94, et Handbook, p. 101. Nomen vernaculum N. Zelandicum, teste Hooker, "Raukana."—Mountainous regions of the Northern and Middle Islands of New Zealand (Edgerley! Colenso! Bidwill! Hector! in Herb. Hook.).

According to Edgerley, the natives rub their bodies with the fragrant leaves of this tree, whence the name.

XIV. On the Genus Trevesia.

XXXII. Trevesia, Visiani, Mem. della Reale Acad. della Sc. di Torino, ser. ii. tom. iv. p. 262; C. Koch, Wochenscrift, 1859, p. 67; Walp. Rep. v. p. 226; Miq. Ann. Lugd.-Bat. i. p. 10. (*Actinanthe*, sect. *Sciadophylli*, Miq. Comm. Phyt. p. 102.)—Pedicelli inarticulati. Flores ecalyculati, polygamo-monoici. Calyx tubo brevi-turbinato v. ellipsoideo-urceolato, limbo brevissimo integerrimo v. obsoletissime 8–10-denticulato, in fructu irregulariter crenulato. Petala 10, abortu pauciora, ovato-linearia v. ovato-triangularia, basi plus minus connata, æstivatione valvata. Stamina petalorum numero; filamentis breviusculis; antheræ ovatis, æstivatione biserialiter imbricata. Stylus 1; stigma 10-radiata. Ovarium 10- v. abortu 8–4-loculare, loculis 1-ovulatis. Drupa exsucca, stylo coronata, 10–4-pyrena, pyrenis chartaceis ligneis. Semina valde compressa; albumen æquabile; cotyle-

dones lanceolatæ.—Frutices v. arbores Asiæ tropicæ, aculeatæ, pube stellata; foliis amplis palmatilobis, lobis serratis v. pinnatifidis; umbellis in paniculos terminales dispositis, floribus viridiusculis.

Allied to *Reynoldsia*, from which it differs in habit, shape of the petals, ovate anthers, stigmas seated on an elongated style, and ovary not having more than 10 cells.

1. *T. Sundaica*, Miq. in Bonplandia, 1856, p. 137; Fl. N. Ind. vol. i. pars i. p. 747; Ann. Lugd.-Bat. i. p. 11; Regel, Gartenflora, 1864, t. 438.—*Sciadophyllum palmatum*, Bl. Bijdr. p. 875; De Cand. Prodr. iv. p. 259. *Brassaia palmata*, Dcne. et Planch. in Rev. Hort. 1854, p. 106. *Aralia Reinwardtiana*, Steudl. Nom. Bot. i. p. 119 (errore typog. "Reinwoldiana"). *A. palmata*, Reinw. (non Linn. nec Willd.).—Java.

2. *T. palmata*, Visiani, l. c.; C. Koch, l. c. p. 67 et 371.—*Gastonia palmata*, Roxb. Cat. Calc. 33; Lindl. Bot. Reg. t. 894. *Gilibortia palmata*, De Cand. Prodr. iv. p. 256. *Aralia palmata*, Hort. *Hedera ferruginea*, Wall. Cat. n. 4909.—India (Wallich!, n. 4910), Sikkim (Hooker et Thomson!), Calcutta Bot. Garden (Roxburgh!, n. 273, in Mus. Brit.).

3. *T. Molluccana*, Miq. in Bonplandia, 1856, p. 137; Fl. N. Ind. l. c. p. 478, et Ann. Lugd.-Bat. p. 220.—*Aralia (?) palmata*, Lam. Dict. i. p. 224; De Cand. Prodr. iv. p. 258; Rumph. Amb. iv. t. 43. —Moluccas.

May be identical with *T. palmata*, Vis.

4. *T. Zippeliana*, Miq. in Ann. Lugd.-Bat. p. 11.—*Eschweileria palmata*, Zippel, Herb. et mss.—Amboina (Zippelius).

"*T. Moluccanæ*, Miq., simillima, sed ovario drupisque 4-locularibus cæt. sui juris, ab Zippelio tanquam proprii generis typus in mss. adumbrata" (Miquel).

5. *T. insignis*, Miq. Ann. Lugd.-Bat. i. p. 220; petiolo aculeato, aculeis mollibus sparsis subfasciculatisque; foliis amplis digitato-7-partitis, lobis infimis minoribus, 3 mediis subæqualibus, omnibus præter basin attenuatam apicemque pinnatifidis spinuloso-serratis, pergamaceo-chartaceis glabris, nervis lobos primarios intrantibus validis utrinque exsertis; umbellis 5-floris; drupis 5-angulatis.—Bantjan, Moluccas (Teijsmann), New Guinea (Hinds! in Herb. Benth.).

There is only one indifferent specimen in Bentham's Herbarium, to which he alluded in Lond. Journ. of Bot. ii. p. 222.

On the Distribution of Mosses in Great Britain and Ireland, as affecting the Geography and Geological History of the Present Flora. By J. Shaw, Esq.

(Abstract of Paper read before the British Association.)

After tracing the distribution of those Mosses in Britain which we have in common with North America, Arctic America, Boreal Europe, Germany, and the shores of the Mediterranean, the author proceeded to inquire into the age of our present Flora. Most geologists, he said, are now agreed that the Glacial epoch was one of great rigour, and that to our islands it brought a complete annihilation of all vegetable as well as animal life. Some believe that the glaciation of the land did not extend uninterruptedly throughout the whole period, but that it was broken up at different times; and speculations, which are now attracting much attention, would go far to demonstrate that there were alternations of extreme cold and mild temperature. But these modifications of previous views do not affect the position that from the glacial age we must date the history of the entrance of the various plants into our islands, which our flora has in common with the floras of Scandinavia, the Arctic and Alpine regions, and the North American mountains.

During the last period of glaciation, the plants would retreat to the south; on the return, however, of a mild climate they would commence to travel northwards and upland; and thus it has come, that the Arctic and Alpine, the sub-Arctic and sub-Alpine floras are all but identical. As the temperature increased, the land rose, and at length the British seas were emptied out, and Britain was connected with the Continent. The northern floras would then commence to enter our latitudes, and in due course the Germanic.

There was a period when the temperature of Britain was much higher than at present. Mr. Watson, in the 'Cybele Britannica,' states that the trunks of large Pines occur in peat at an elevation of nearly 3000 feet,—much higher than their present limit, which is 1950 feet. Dr. Dickie furnishes similar evidence in his 'Botanist's Guide to Aberdeen, Banff, and Kincardine.' This period of great warmth came on probably soon after the time of land connection with Europe, and would bring with it a southern flora. How high the land rose in Britain above the sea-level we cannot compute; it must have been to

a height of some hundreds of feet above our present elevation. For there must have been surface and elevation for a meridional, temperate, and alpine flora.

The land began to subside again as the temperature lowered; the more southern forms retreated, but a few remained in stray nooks. From the peculiarities of temperature in Britain, through the Gulf Stream, our climate has been always, since the glacial epoch, less rigorous than corresponding latitudes. Hence southern plants have remained with us, while they have altogether vanished from the rest of Northern Europe. A goodly number have clung, in all subsequent vicissitudes to the south of England, but especially to the south-west of Ireland.

The career of invasion and extension was stopped when Britain was again isolated. The Gulf Stream became more thoroughly a modifying agency in the climate of our islands, keeping our latitudes tolerable to the delicate southerners, but crippling at the same time our alpines.

There yet remains one inquiry to be investigated. When was the community of species between America and Europe brought about?

It must have been anterior to the entrance of the various floras into Britain, for subsequent to the glacial epoch there was no period cold enough to admit of the transmission of alpine and subalpine species over the plains to the mountains.

Similar phenomena of community of species in the two continents happened during previous geological ages. The miocene floras of Greenland, Iceland, and North America have many species in common with the same floras of Northern and Central Europe. That age, which allowed of the same plants which occurred in Central Europe—trees of considerable dimensions and a vegetation of some luxuriance—to penetrate into Greenland and Iceland, must have been one of considerable temperature.

The earliest traces of the present assemblage of plants in our islands are found in the celebrated Cromer Forest, which overlies the Tertiaries of Norfolk. The prevailing tree is the *Pinus sylvestris*, which is found now in the more northern latitudes. The age of the Cromer Forest immediately preceded the glacial. We have, therefore, as is admirably deduced by Lyell, evidence of a gradual refrigeration from the miocene period to the glacial.

This course of argument restricts us to the conclusion that the pre-

sent community of species in Europe and America was brought about during the glacial age, as we have seen that it could not have occurred after that period, so it could not have occurred before it.

I have already referred to the recent papers of Mr. Croll in elucidation of Sir John Herschel's theory of the causes of the great changes of climate during the glacial age. I have also referred to the geological evidences of breaks in the glacial age. Here accordingly in this community of species we have another proof that the glacial age had one or more breaks, consisting of very considerable elevation of temperature, when the land rose, and there was a highway between Europe and America by way of Iceland and Greenland. Trees and higher forms of vegetable life grew freely along the highway, so that the temperature must have been of a very considerable mean. It was not high enough to admit any of the plants of the meridional region, for we find no community of species in the southern forms of Europe and America; but plants of the Regio Septentrionalis and Regio Intermedia freely passed over it.

SCOLOPENDRIUM OFFICINARUM IN WESTERN NEW YORK: PROBABLE DETERMINATION OF THE ORIGINAL LOCALITY OF PURSH.

By J. A. Paine, Jun.

At the request of Dr. Gray, a trip to the hills of South Herkimer county for rare Orchids, was lately extended to Onondaga county, for the identification, if possible, of the habitat of this Fern, so rare with us, which Pursh discovered and recorded. The ravine of Chittenango Creek is too far east by twenty miles or more to be referred to his remark. Jamesville, therefore, was visited, to find out how far this new station is from Onondaga, and if near or upon lands which ever were "plantations of J. Geddis, Esq." At once it was seen that this locality—detected last March by Mr. Lewis Foote, as announced in the May number of this Journal—though not far from Onondaga Hill, is far and nearly in an opposite direction from the residence and possessions of the late James Geddes, which are directly west of Syracuse. Mr. Foote having particularly described his station as in a rocky ravine, half a mile below the village, two hundred feet east of the rail-

road, etc., it was taken for granted that the place thus designated was in one of three or four points where the bed of Butternut Creek narrows into rocky gorges, or at the entrance of a tributary stream, so a second observation appeared unnecessary. Attention, however, was directed to two or three interesting localities known as "pit-hole lakes," deep depressions in the surface, walled round on all sides but one with rock at least one hundred feet high, a quarter of a mile across from side to side, usually having a small pond in the centre with no visible outlet, localities of which no satisfactory explanation has been given, but greatly resembling whirlpools, as the one in the Niagara river. On the shaded talus of the nearest of these, "Little Lake," about one mile west of the town, *Scolopendrium* was detected in limited quantity, with *Camptosorus rhizophyllus*. Green Pond and White Lake occur near together, two miles east of Jamesville, at the base of a remarkable outcrop of the limestone range, from one to two hundred feet high and four or five miles long, the former similar in character to Little Lake, and lying far within the irregular line of the cliff, like a bay along its coast. These "highlands," before they were cleared and burned over, formed the very kind of locality where our rare Fern delights to dwell, possessing all the conditions of loose limestones, rich mould, moisture and shade; and no doubt, their high rocky steeps formerly abounded with it. This presumption is confirmed by the fact that on a particular part of the range, where the fire and clearing ceased and the undisturbed forest began, on the talus of a low ledge, just there was *Scolopendrium* found growing in its greatest luxuriance and scattered along the bank for a fourth of a mile or so, as far as covered by woods. Directions to other like places by a gentleman in the village who recognized the plant, indicate that it may not be infrequent throughout the town.

Onondaga Valley affords frequent outbreaks of the same limestone rock along its sides, and in gorges of streams descending to the creek, where this Fern may grow.

Hon. George Geddes, son of the J. Geddes, Esq., referred to by Pursh, was then appealed to for information in general respecting this Fern of its earliest station, and he readily cleared up the whole mystery. The place where it was discovered, he said, was nearly five miles west of Syracuse, and half a mile south of his father's house; on the single point of its being on his father's farm Pursh must have erred; but it

was near by, along a high ledge and about a celebrated sulphur spring. Mr. Geddes very kindly extended the hospitalities of the same mansion in which Pursh made his stay while exploring in this region, and accompanied the writer to a locality called Split-rock, half a mile south of Fairmount, the residence of Mr. Geddes, who confidently believes this to be the place where Hart's-tongue was discovered and formerly flourished. He recollects perfectly well how, when a boy, the existence of the Fern having been doubted, his father charged him to search carefully for it in his hunting excursions, and directed him specially to this locality. Split-rock is another development of the limestone formation, probably one hundred and fifty feet high and over half a mile long, semicircular, with a brook at its base on whose bank is the sulphur spring. Its lofty and long rocky slope beneath the cliff, once a most favourable station for *Scolopendrium*, was long since cleared, dried up, and trodden over by cattle. Walking-Ferns still linger, and even abound where there is any shade, but it is to be feared that all Hart's-tongues have perished.

In Madison county this plant may be looked for among the upper branches of Cowaselon Creek, east of the Chittenango Valley, which pass through ravines and over falls; and around a number of pit-hole lakes westward. The station below Chittenango Falls, brought to light about the year 1830, by William Cooper, Esq., which for so long time has been regarded as the only locality of this plant on our continent, therefore, must have been unknown to both Pursh and Nuttall. The record of the latter, "*S. officinarum, v. v.* In the western parts of the State of New York, in the crevices of calcareous rocks, beneath the shade of the Hemlock Spruce (*Abies Canadensis*), and accompanying the *Taxus Canadensis*, or American Yew," probably is merely a confirmation of the habitat of Pursh. His statement, "near Canandaigua, at Geddis's Farm, in a shady wood, with *Taxus Canadensis*," as reported by Dr. Pickering to Dr. Torrey to have accompanied specimens in the herbarium of the Academy of Natural Science in Philadelphia, most likely was an error for near Onondaga, etc., easily made from similarity in the names, or from the indefinite extent covered by the former name at that time, 1806–1818. However, no such statement now exists in the herbarium at Philadelphia with Nuttall's specimens; and for the identity of his with the habitat of Pursh as above ascertained, we have "Geddis's Farm," with both *Abies Canadensis* and *Taxus Canadensis* remaining in abundance near by.

The connection of *Scolopendrium* with Lake Simcoe, Canada West, as given in this Journal and repeated in a Catalogue of Oneida County Plants, has been a mistake for Owen Sound on the Georgian Bay. Here it was discovered in 1857 by Professor William Hincks, growing plentifully on the rocks around the falls of a stream emptying into the Sound; since then it has also been observed by others in adjacent localities.

Geologically, this Fern is confined to the limestones, and may be searched for wherever the Helderberg, Niagara, and Trenton groups afford favourable stations.—*From the Am. Journ. of Science, September*, 1866.

LIST OF VENEZUELAN WOODS, WITH THEIR VERNACULAR NAMES AND SPECIFIC GRAVITY.

By A. Ernst, of Caracas.

1.	Acacia Farnesiana, *L.*	1·05—1·12	Cují.
2.	Achras Zapota, *L.*	0·90—1·00	Níspero.
3.	Anacardium occidentale, *L.*	0·50—0·52	Mereï.
4.	Anona palustris, *L.*	0·20—0·25	Guanábano cimarron.
5.	Anona reticulata, *L.*	0·30—0·35	Riñon.
6.	Anona muricata, *L.*	0·32—0·35	Guanábano.
7.	Artocarpus incisa, *L.*	0·50	Arbol de pan.
8.	Bixa Orellana, *L.*	0·40—0·50	Onoto.
9.	Cassia Fistula, *L.*	0·62—0·65	Cañafístola.
10.	Cedrela odorata, *L.*	0·50—0·52	Cedro amargo.
11.	Chrysophyllum Caïnito, *L.*	0·76	Caïnito amarillo.
12.	Citrus Aurantium, *L.*	0·80—0·82	Naranjo.
13.	Copaifera officinalis, *L.*	0·75	Copaïva.
14.		1·30	Dividive.
15.	Erythrina Corallodendron, *L.*	0·25—0·28	Bucare.
16.	Ficus velutina, *H.B.K.*	0·40—0·42	Higueron.
17.	Guazuma ulmifolia, *Lam.*	0·45—0·52	Guásimo.
18.	Guajacum officinale, *L.*	1·00—1·36	Guayacan.
19.	Heliocarpus Popayanen. *H.B.K.*	0·42—0·45	Majagua.
20.	Hura crepitans, *L.*	0·45	Javillo.
21.	Inga fastuosa, *H.B.K.*	0·42—0·44	Guamo.
22.	Jambosa vulgaris, *DC.*	0·60—0·70	Pomarosa.

23.	Licania ?	0·90—0·95	Mijao.
24.	Lucuma mammosa, *Gr.*	0·50—0·52	Zapote-Mame.
25.	Mammea Americana, *L.*	0·80—0·85	Mameï.
26.	Mangifera Indica, *L.*	0·80—0·85	Mango.
27.	Melicocca bijuga, *L.*	0·80—0·90	Mamon.
28.	Murraya exotica, *L.*	0·80—0·84	Azahar de la India.
29.	Ochroma Lagopus, *Sw.*	0·18—0·24	Lana vejetal.
30.	Oreodoxa regia, *Kth.*	0·75—0·80	Chaguaramo.
31.	Persea gratissima, *G.*	0·62—0·65	Aguacate.
32.	Poinciana pulcherrima, *L.*	0·85	Clavelina.
33.	Psidium Guava, *Radd.*	0·75—0·82	Guayave.
34.	Pterocarpus Draco, *L.*	0·45—0·55	Sangre de drago.
35.	Rhopala montana, *Aubl.*	0·80—0·95	Chaparro.
36.	Rhus juglandifolium, *H.B.K.*	0·65	Manzanillo.
37.	Sapindus Saponaria, *L.*	0·62—0·70	Parraparra.
38.	Spondias lutea, *L.*	0·50	Jobo.
39.	Swietenia Mahagoni, *L.*	0·78—0·85	Caoba.
40.	Tamarindus Indica, *L.*	0·80—0·85	Tamarindo.
41.	Tecomæ spec.	0·62	Apamate.
42.	Terminalia Catappa, *L.*	0·93	Almendron.
43.	Thevetia neriifolia, *Juss.*	0·75—0·80	Retama.
44.	Trichilia spondioides, *Sw.*	0·45—0·55	Cedrillo.
45.	Vismia ferruginea, *Kth.*	0·62—0·65	Onotillo.
46.	Catoblastus præmorsus, *Wendl.*	1·31	Palma Prapa.
47.	? (Dicotyl.)	0·79	Cartan.
48.	Cocos nucifera, *L.*	0·75—0·82	Coco.

NEW PUBLICATIONS.

Handbook of the British Flora, for the use of Beginners and Amateurs. By George Bentham, F.R.S. New edition (2nd). London: Lovell Reeve and Co. 1866.

A lapse of eight years since the publication of the first edition of this work has not been productive of much change in its matter or arrangement. It has, however, undergone a thorough revision by the author, and the changes are for the better. There have been added to the number of species included in the former edition, twelve additional

ones. Of these, two are entered under protest, "in conformity to general usage," *Ranunculus hederaceus* and *Asplenium viride*, and one, "on the authority of Irish botanists," *Utricularia media* ("*intermedia*" in the text). Of the other nine, three are described as "foreign introductions," more or less established, *Claytonia perfoliata*, *Trifolium hybridum*, and *Spiræa salicifolia*; two as having been "proved to be truly indigenous," *Sisyrinchium Bermudiana* and *Smilacina bifolia*, and one as "perhaps originally introduced," *Lathyrus tuberosus*; whilst the remaining three are recent discoveries,—two Irish, *Inula salicina* and *Orchis intacta*, and one English, *Lemna arrhiza*. The other changes are chiefly necessary alterations, in references, etc., consequent on the publication of new editions of Hooker and Arnott's 'British Flora' and Babington's Manual, and on the appearance of Mr. Syme's revised edition of 'English Botany.' The existence of the latter work has rendered it unnecessary, in the opinion of the author of the 'Handbook,' to continue his references to the old edition of 'English Botany.' This omission has saved a line under most species, and, with other small prunings, has reduced the number of pages from 655 to 600.

The clear and excellent descriptions in which the writer seems so accurately to have laid hold of the most prominent and conspicuous points of each plant, joined with the analytical keys to the genera and species, combine to render this Handbook, for beginners, a most valuable introduction to our native flora; whilst, as an exposition of the philosophic views applied to a limited field of a most accomplished and profound botanist, it has an interest rarely attaching to a work of such small pretensions.

Contributions towards a Cybele Hibernica, being Outlines of the Geographical Distribution of Plants in Ireland. By DAVID MOORE, Ph.D., and A. G. MORE, F.L.S. Dublin.

[SECOND NOTICE.]

In 1832 there appeared a work under the following title, 'Outline of the Geographical Distribution of British Plants,' by Hewett Cottrell Watson, printed for private distribution; and in 1835 another by the same author, entitled 'Remarks on the Geographical Distribution of British Plants, chiefly in connection with Latitude, Elevation, and Climate.' In 1843, Mr. Watson published 'The Geographical Distribution of British Plants,' part i., which, however, was not con-

tinued on the same extensive plan, but gave place to 'Cybele Britannica,' which is, or ought to be, familiar to every student of British botany. Previous to these important contributions, very little was known respecting the distribution of plants in Britain; Mr. Watson, in fact, has been not merely the pioneer, but the only one who has directed special attention to the subject, and any other observations have been chiefly local and supplemental.

While so much has been done in Britain, a 'Cybele Hibernica' has been till now a desideratum; facts have been recorded respecting stations, comparative rarity, etc., of Irish plants; the present work, while containing a large amount of information under such heads, embraces more. In the preface the authors inform us that—

"The work originated in a desire to furnish not only a revised list of the wild plants of Ireland, but also a classified summary of their localities. Thirty years having now elapsed since the publication of Mackay's 'Flora Hibernica,' within which period many additions have been made to Irish botany, many plants have become better known, and the range of others has been greatly extended. With the view of meeting the requirements of geographical botany, we have endeavoured to arrange our materials somewhat after the plan of Mr. Watson's 'Cybele Britannica' (whence our title); and thus we hope that the details collected will be found methodized in such order as to be available to those who study the range of plants, while the traveller will also be able to use our book as a botanist's guide through Ireland."

Respecting the qualifications of the authors for the proper accomplishment of such purpose, we feel assured that they combine a thorough knowledge of native plants, with the utmost scrupulosity in admitting species as Irish without due proof, no matter by whom recorded, as well as extensive acquaintance with Hibernian vegetation founded on personal observation.

Questions in botanical geography relate not merely to existing conditions, but have a bearing also on changes during former epochs; and in the present instance it is important to receive authentic information as to what plants of Europe have reached Ireland, one of its most westerly fragments, and one of the "back settlements" open to vegetable colonists from the Continent.

The authors judiciously adopt Mr. Watson's "types," as affording a convenient means of comparison. The flora of Ireland is chiefly remarkable for the occurrence of a few plants characteristic of the west and south of Europe, which reach a higher northern latitude than on

the Continent. A few species, viz. four, *Neottia gemmipara*, *Sisyrinchium anceps*, *Eriocaulon septangulare*, and *Naias flexilis*, seem to point to a former connection with North America; of seventy species belonging to the Atlantic type, Ireland contains 41; those of the Germanic type are few, 18 only out of 127; Ireland contains rather more than one-third of those belonging to the Highland type, these are chiefly confined to the north and west; those of the Scottish and intermediate types are more numerous, viz. 66 out of 117. Of 1425 species* given by Mr. Watson as the total number of the British flora, Ireland contains about 950; adding to these, plants which occur in Ireland but not in Britain, and various *Hieracia* and *Rubi*, the authors compute the whole Flora at about 1000 species, and therefore even at the lowest estimate, considerably under the number found in Britain. The species found in Ireland but not in Britain are 22 in number, or, rather, say 19,—doubtful species of *Saxifraga* being excluded; these, with one exception, are confined to the south and west. Of the deficiencies in the Irish Flora only a few are specified; we think that a full list ought to have been given, as being a point of considerable interest.

In order to afford a general idea of the range of each species, the authors have adopted the divisions proposed by Professor C. C. Babington, in a paper read before the Dublin University Zoological and Botanical Association in 1859; the particulars of the twelve districts and their characteristic plants are described in the introduction, and fully illustrated by means of an excellent map. The remainder of the introduction embraces a list of the species and a tabular view of their range in Ireland.

In the body of the work we have minute information respecting each plant. A single example will suffice:—

> " *Ranunculus hederaceus*, L.
> Districts. 1 2 3 4 5 6 7 8 9–11 12.
> Lat. 51°–56°. Throughout Ireland.
> Type in Great Britain, 'British.'
> On wet mud, shallow pools, etc.; common.
> Fl. May to August.
> Ranges from sea-level to 600 feet in Derry."

* Some would consider this an over-estimate, there being different opinions as to what plants deserve to rank as species.

With respect to altitudinal range, it is to be regretted that it is not added regarding each species, and this because data are in most cases wanting. Here botanists who feel inclined to give assistance have a field of great importance, almost untouched in Ireland, and which we can, from personal experience, recommend as adding materially to the interest of botanical explorations. Lists of species growing on the tops of mountains can be easily made, and the heights of all these are now known; contour lines on the Ordnance map give at a glance lower altitudes where other lists may be made, and if the observer, for his own satisfaction, desires a portable instrument sufficiently accurate for the work, we can recommend the aneroid barometer. Excellent instruments can now be got about the size of a pocket-watch; the mountain barometer is an incumbrance to a botanist in alpine scrambles. We have found the mountain sympiesometer more portable, but now prefer the aneroid.

The importance of this branch of inquiry is such that no apology need be made for adding here a few hints gleaned from a paper, a model in its way, and deserving perusal, published by Mr. H. C. Watson in the 'London Journal of Botany,' vol. i. 1842. Before commencing the ascent, make a note of the pressure of the atmosphere; while ascending, set down in a note-book the names of all plants of higher ground than the starting place, in the order in which they are first observed. After ascending some distance make a halt, and note the pressure of the atmosphere, and again ascend, still writing down the names of plants as they successively come under view; the summit of the hill being reached, after alternate stoppages and ascents, the pressure of the air is again to be noted, and as complete a list as possible is made of plants growing close round the summit. On the descent the same plan is pursued, except that the names of all plants not observed on the summit are duly entered in the note-book, in the order of their first appearance, that is, of their highest observed limits along the track passed over. On again reaching the original starting-place, the pressure of the atmosphere is carefully noted, a point of importance, because it may have altered since the first observation was made. Stoppages during ascent and descent are recommended to be made at the first station for any shrub or other plant whose exact limit we may desire to ascertain. It need scarcely be stated that the height of the starting-point above the level of the sea must be added.

Besides altitudinal range of species, it is important to know what are the upper limits of agricultural plants in different parts of Ireland, as well as the exotics which thrive in gardens at various heights and stations. The authors read a joint paper on this very subject at one of the meetings of the late Botanical Congress, a statement of the facts collected would have formed an appropriate subject in the introduction in connection with climate.*

The compilation of the 'Cybele Hibernica' must have cost a great amount of labour; the work contains an excellent summary of all that is known respecting the Irish Flora to the present date, but there are many parts almost or altogether unexplored, and we recommend the young botanists of Ireland to combine together and portion out certain districts for more thorough investigation.† In this way a large body of additional facts could be gathered; isolated efforts are less likely to be fruitful in results; and why should the work be left to casual visitors from the other side of the Channel. Various points might well form subjects for further inquiry. There are peculiarities in the distribution of certain species in Ireland which have a wider range in Britain. The following, for example, are confined, so far as known at present, to a few spots in the western districts of the former country, viz., *Thalictrum alpinum*, *Arabis petræa*, *Astragalus Hypoglottis*, *Spiræa Filipendula*, *Alchemilla alpina*, and *Saxifraga nivalis*. In treating such questions it is requisite to avoid conclusions founded on too limited premises; the four plants supposed to "point to a former connection with N. America," afford data insufficient for any positive conclusion; one of them at least is not confined to Ireland,—*Naias flexilis* is recorded as growing near Stettin.

In Mackay's 'Irish Flora' the *Cryptogamia* were included, excepting the Fungi; many species have been added since, and opinions somewhat modified regarding several recorded in that work. It is to be hoped that the 'Cybele Hibernica' may soon reach a second edition, in which we trust that department will be included. Dr. Moore has

* At p. 17 is a table of mean temperatures for sixteen different places; the authors remark that "the mean annual temperature of Ireland is a little over 50° F., which is about the same average as South Britain." The column of the table, however, on which we presume the statement is founded, gives a different result, viz. 49°·6 F.

† While we write it is reported that *Acorus Calamus* has been added to the Irish list, the plant having been got in considerable quantity between Lisburn and Moira.

already done good service in several of its branches; the marine *Algæ* have been well examined by the late Professor Harvey and others; and where such lichenists as Mr. Carrol and Admiral Jones are at work, there can be no lack of contributions.

The British Association granted £25 to aid the publication; and while it is gratifying to see such a list of subscribers appended, still the expense of the book must have been but partially provided for.

The authors deserve the thanks of botanists and of those who take an interest in the progress of natural science. All such, not already in the list of subscribers, can best show their appreciation by becoming purchasers; and as the work is excellent of its kind, it ought to be in the libraries of the various educational and other institutions of Ireland. G. D.

List of British Ferns and their Varieties. Compiled by P. NEILL FRASER. Edinburgh, 1866.

The interest that has for some years been taken in the cultivation of these plants, and the passion for new varieties, has brought out the remarkable fact that in clearly defined and easily recognized species there is scarcely any limit to variations, which, under cultivation, retain their peculiarities so as to form permanent varieties. As long as the plants are multiplied by fragments of the original individual, every peculiarity adheres to the various plants, but when reproduced by spores only some of them are true to the variety, others present the normal form of the species, and the remainder exhibit intermediate forms between those of the species and the variety. Mr. M'Nab gave some interesting facts in regard to his experience in growing seedling varieties at a recent meeting of the Edinburgh Botanical Society (*vide* p. 368). Mr. Fraser is known to be critically acquainted with this order of plants, and his catalogue consequently has a very different value than those prepared by florists. He has endeavoured to discover the synonymy of the varieties, and would be glad to have named specimens, that he may continue this work, and still further reduce some of the so-called varieties to their proper place as synonyms in his list. He enumerates 46 species of British Ferns, and he requires thirty-three closely-printed octavo columns to contain the list of their varieties! *Athyrium Filix-fœmina*, *Scolopendrium vulgare*, and *Polystichum angulare* have sup-

plied the largest number of these varieties. Excluding synonyms, Mr. Fraser gives the names of 338 recorded varieties for each of the two first-named species, and 293 for the last. Does not the Darwinian see in this the indication that the Britain of future ages will in its Fern-flora far outstrip our present impoverished period, having it increased some 300-fold? And then the varieties! Our nurseryman may mourn that he has been born in these degenerate days. A few species persistently refuse to produce any form differing from that to which the specific name was originally applied. They object to take advantage of the benefits which "natural selection" gives them, very much to the annoyance of Fern cultivators. These refractory conservative species are—*Asplenium septentrionale*, *Cystopteris montana*, *Gymnogramme leptophylla*, *Lastrea Thelypteris*, *Polypodium Dryopteris*, and the species of *Hymenophyllum* and *Woodsia*.

BOTANICAL NEWS.

Germany has lost another of her ablest men of science, in Dr. D. F. L. Schlechtendal, Professor of Botany at Halle, who died on the 12th October last.

The Rev. W. A. Leighton has ready for issue the thirteenth Fasciculus of his 'Lichenes Britannici Exsiccati.'

The Rev. M. J. Berkeley has received specimens of *Agaricus collinus*, Scop., from Durham,—a species not hitherto noticed in Britain.

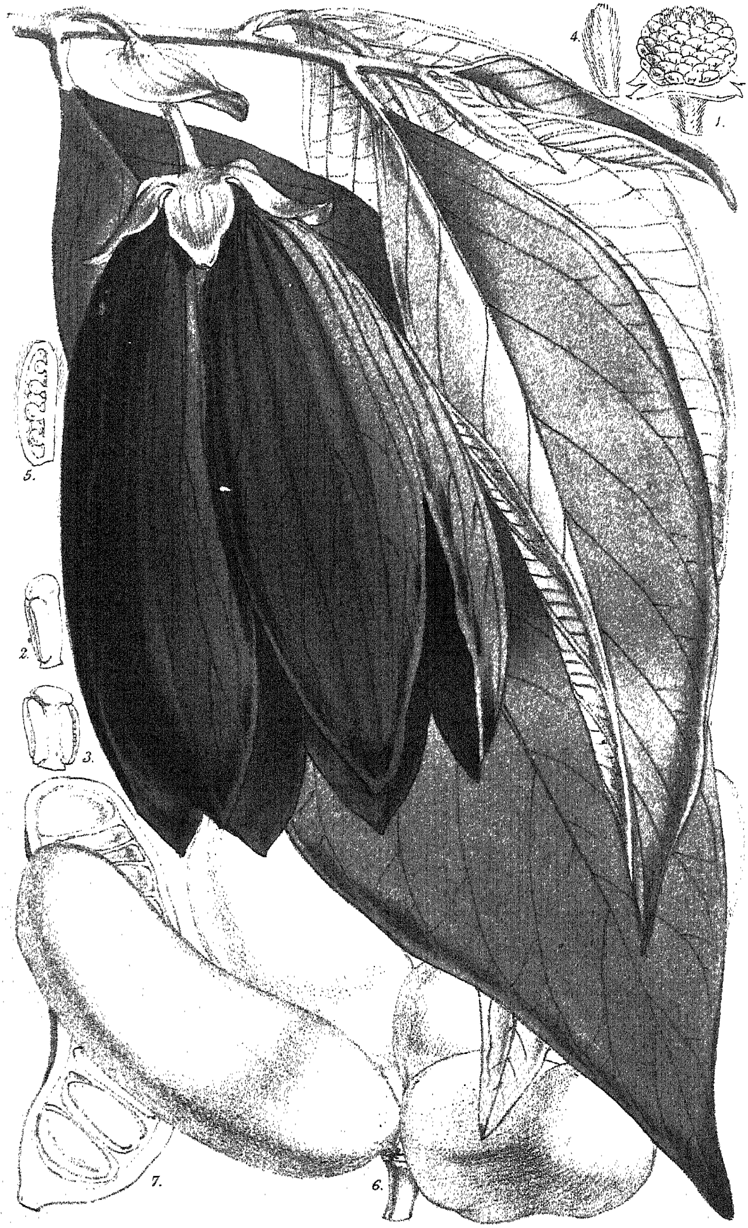
We have received notice of the death of William Tyrer Gerrard, of Natal, whose botanical discoveries are frequently alluded to by Harvey and Sonder in their 'Flora Capensis.' He has added several new genera, and upwards of one hundred and fifty new species to the Natal flora, several of which deservedly bear his name. Gerrard left Natal in April, 1865, and arrived in Madagascar during the following month, where he made large collections of plants, insects, birds, etc., on the coast-line between Tamatave and Mahambo. At Foul Pointe he fell a victim to pestilential marsh fever. The death of so accomplished and indefatigable a naturalist, far away from friends and home, is with much sincerity deplored by a numerous circle of friends to whom he had endeared himself.

Among the recent changes introduced into the High School of Edinburgh, it was resolved to give a series of instructions on the natural sciences. Mr. J. Sadler, Botanical Demonstrator in the University of Edinburgh, recently delivered the first lecture of a course on botany, to a large audience, showing a lively interest, on the part of the scholars, in the subject. This is a step in the right direction, by one of the first scholastic institutions in Scotland, and will

doubtless lead to a more general recognition of the importance of such studies in elementary education.

THE CEDARS OF LEBANON.—Dr. Hooker makes the following interesting communication to a recent number of the 'Gardeners' Chronicle:'—"The Rev. M. Tristram, F.L.S., informs me of a most interesting discovery lately made in the Lebanon, viz. of several extensive groves of Cedar-trees, by Mr. Jessup, an American missionary, a friend of his own, to whom he pointed out the probable localities in the interior. Of these there are five, three of great extent, east of 'Ain Zabalteh, in the Southern Lebanon. This grove lately contained 10,000 trees, and had been purchased by a barbarous Sheikh, from the more barbarous Turkish Government, for the purpose of trying to extract pitch from the wood: the experiment of course failed, and the Sheikh was ruined, but several thousand trees were destroyed in the attempt. One of the trees measured 15 feet in diameter, and the forest is full of young trees, springing up with great vigour. He also found two small groves on the eastern slope of Lebanon, overlooking the Buka'a, above El Medeûk; and two other large groves, containing many thousand trees, one above El Barûk, and another near Ma'asiv, where the trees are very large and equal to any others; all are being destroyed for firewood. Still another grove has been discovered near Dûma, in the western slope of Lebanon, near to the one discovered by Mr. Tristram himself. This gives ten distinct localities in the Lebanon, to the south of the originally discovered one, and including it. Ehrenberg had already discovered one to the north of that locality, and thence northwards the chain is unexplored by voyager or naturalist.

BOTANICAL SOCIETY OF EDINBURGH.—*July 12th.*—Dr. Alexander Dickson, V.P., in the chair. The following communications were read:—1. On the Staminal arrangements in some species of *Potentilla* and in *Nuttallia cerasiformis*. By Dr. Alex. Dickson (*ante*, p. 273).—2. On the Structure and Affinities of *Lepidodendron* and *Calamites*. By William Carruthers, Esq., British Museum (*ante*, p. 337.)—Account of a Botanical Excursion to Forteviot and Invermay, Perthshire. By Mr. John Sadler. Dr. John Lowe recorded the discovery of *Lepidium Draba* in a naturalized state, near Lynn, Norfolk, by Mr. B. Bray. Professor Balfour stated that Dr. J. E. Gray notices, in the 'Journal of Botany,' *Phyllactidium pulchellum* as a freshwater *Alga* new to England. It was also found thirteen years ago in Scotland by Mr. George Lawson in the water of a vase at the Royal Botanic Garden in June, 1853, and Professor Balfour exhibited under the microscope specimens put up at that time by Mr. Lawson. Mr. M'Nab exhibited a number of seedlings raised from spores of the *Athyrium Filix-fœmina*, var. *Victoria.* Very few of the plants raised presented the peculiar form of the parent variety, most of them assuming more or less the appearance of the ordinary crested variety. Many of them also approached the specific form. In connection also with this subject he gave a statement of the proportions of crested forms procured from spores of the following varieties:—*Asplenium Trichomanes cristata*, 100 per cent. true; *Lastrea Filix-mas cristata*, 95; *Athyrium Filix-fœmina cristata*, 90; *Athyrium Filix-fœmina Frizellæ*, 50; *Athyrium Filix-fœmina Victoria*, 25; *Blechnum boreale cristata*, 75; *Blechnum boreale crassicaule*, 75.



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ON SAPRANTHUS, A NEW GENUS OF ANONACEÆ, FROM CENTRAL AMERICA.

By Berthold Seemann, Ph.D., F.L.S.

(Plate LIV.)

During my recent explorations of Nicaragua, one of the republics of Central America, I discovered in the western parts of that country, between the cities of Leon and Granada, a middle-sized tree, with oval velvety leaves and large bell-shaped flowers. The latter, when first opening, are of a very light green, but they gradually change into a very dark bluish-black, and then emit a most powerful carrion-like odour, quite as disagreeable as that of some *Stapelias*, *Aristolochias*, and *Aroideæ*. It is in allusion to this peculiarity that, at the suggestion of Mr. J. J. Bennett, I have given the name of *Sapranthus* to the plant, which proves to be the representative of a new genus, allied to *Porcelia* and *Uvaria*. It is strange that the carrion-like smell peculiar to *Sapranthus* and the other plants mentioned should always accompany a dark brown or dark blue colour, and it would be worth while to ascertain the chemical principle here at work. The most singular feature of this plant, besides its carrion-like odour and dark-coloured corolla, is the very large size of the petals, 4–5 in. long; they are larger in fact than those of the African genus *Monodora*, and *Sapranthus* is thus the *Anonacea* with the largest flower known in the Order.

Sapranthus, Seem. gen. nov. *Anonacearum*. (Tab. LIV.) Sepala 3, ovata, acuminata, imbricata. Petala 6, biseriatim imbricata, æqualia, membranacea, explanata. Stamina plurima, cuneata, connectivo ultra loculos truncato-dilatato. Torus globosus. Carpella plurima, stigmate sessili, ovulis ad suturam plurima, 2-serialia. Baccæ oblongæ sessiles. Arbor mediocris, ramulis foliis pedunculisque velutino-pubescentibus; foliis ovalibus utrinque acuminatis integerrimis membranaceis penninerviis; pedunculis axillaribus 1-floris medio 1-bracteatis, bractea cordata acuminata; floribus amplis viridibus, demum atro-purpureis v. subnigricantibus. Species unica:—

1. *S. Nicaraguensis*, Seem. (sp. nov.). Tab. nostr. n. LIV. Common in the western parts of Nicaragua, between Leon and Granada.

Explanation of Plate LIV., representing *Sapranthus Nicaraguensis*, Seem. Fig. 1. Pistils and stamens. 2 and 3. Stamens. 4. Pistil. 5. Section of do. 6. Fruit. 7. Section of do. Figs. 1–4, *magnified;* 4 and 5, *natural size.*

ADDITIONAL NOTE ON PHYLLACTIDIUM.

By Dr. J. E. Gray, F.R.S., V.P.Z.S., F.L.S.

Mr. Carruthers has just shown to me that Mr. J. Ralfs described *Phyllactidium*, in a paper read before the Botanical Society of Edinburgh, December 12, 1844, and January 9, 1845, and printed in the 'Annals and Magazine of Natural History,' vol. xvi. p. 308. t. 10, for 1845; and also in the Transactions of the Botanical Society of Edinburgh, vol. i. p. 186. He there described and figured this genus with its fructification under the name of *Coleochæte scutata*, Brebisson, and he gives several habitats for the species. He says that he sent some dried specimens to Kuetzing, who considered that it was the same as his *Phyllactidium pulchellum;* but Mr. Ralfs thinks that Kuetzing only described the young state of *C. scutata* under that name, for the figure well represents the plant he described before the appearance of the bristles.

This account puts an end to the idea of the plant having been discovered as British by Mr. Lawson, or by my correspondent. Mr. Ralfs received some specimens from the locality from whence my specimen was sent.

Mr. Aylward most kindly sent me some water and mud from the pond whence he derived his specimens. I placed them in two small bottles, and, in the course of this summer, many specimens gradually developed themselves on the inner surface of the bottle, and most of them have developed fruit, as figured by both Ralfs and Suringar. In one bottle made of white glass and of a ventricose form, the specimens are developed pretty equally over the whole surface of the bottle. In the other, which is a tall bottle, of pale green glass, the plants have only developed themselves in a confused cluster just below the edge of the water, on the side furthest from the light, and these plants are much the largest, but the centre of each plant has gradually rotted away, leaving only a large ring of several series of cells. I have observed no such disorganization in the smaller specimens in the white ventricose bottle.

If this plant is the *Bulbochæte* of Brebisson, it is his variety *scutata*, and that variety is, I expect, a permanent species, for I could not discover any specimens, or any state of the growth of the many specimens I

have examined, which shows the slightest approach to what he calls the variety *soluta*.

Mr. Carruthers has also shown me a paper, by Dr. Pringsheim, in his 'Jahrbücher,' vol. vii., for 1860, in which he gives a monograph of the genus *Bulbochæte*, describing six species of the genus. He regards the two varieties of M. Brebisson as distinct species, and he gives most accurate and interesting figures of the development and the kind of fructification of the plant I described as *Phyllactidium pulchellum*, under the name of *Bulbochæte scutata*, see t. 2, 3, and 4. He observes that *Phyllactidium setigerum* is the same as his *Bulbochæte scutata*.

I may remark that I have not observed the hairs on the surface but only on the margin of the plants, but then I have only been able to examine them very imperfectly.

The plant received from Manchester, and which I have grown and observed its development, is certainly the *Coleochæte scutata* of Ralfs and Pringsheim. It agrees in all the particulars which I have observed with the figures of the latter author, the *Phyllactidium pulchellum* of Suringar, and with the dry specimen of the plant under this name in the collection of German Algæ of Rabenhorst. It is most probably the *Bulbochæte scutata* of Brebisson, figured in the original paper in the 'Annales des Sciences Naturelles,' ser. 3, vol. i., but the figure is not so good as those of Pringsheim, loc. cit. t. 4, fig. 3, and it certainly is not the same as the dry specimens so named in the collection of Algæ of Germany, above quoted, which is in the botanical collection in the British Museum. In the plants figured by Ralfs, Pringsheim and Suringar, and in mine, the upper surface of the fruit is flat, the frond is nearly of the same thickness from the centre to the circumference, being, if anything, rather thinner in the centre,—and this is the case in the youngest and oldest specimens. In the specimens of *Bulbochæte scutata* of the German collection, the upper surface of the frond is convex, being more convex in the centre, and the upper surface is covered with swollen prominences. They can scarcely belong to the same genus, and I am inclined to regard the *Bulbochæte* of the German collection as the type of that genus, and the genus *Bulbochæte* of Brebisson, Ralfs, and Pringsheim to be the same as the genus *Phyllactidium* of Kuetzing.

REPORT OF THE CALCUTTA BOTANIC GARDENS FOR THE YEAR ENDING MARCH 31, 1866.

By Thomas Anderson, Esq., M.D.,
Superintendent of the Gardens.

The Gardens.—The arrangement of the plants, according to the natural method, is nearly completed. Groups of nineteen Natural Orders of exogenous plants have been formed during the year; with the exception of *Rubiaceæ* and *Urticaceæ*, all the large Natural Orders of this class of plants are now illustrated in the garden. I have purposely deferred planting the species of these two Orders, as the plants belonging to them suffer little from long-continued cultivation in flowerpots. The Orders represented during the past year are :—

Passifloreæ.	Ebenaceæ.	Solanaceæ.
Cacteæ.	Apocynaceæ.	Scrophularineæ.
Araliaceæ.	Asclepiadaceæ.	Labiateæ.
Goodenoviaceæ.	Loganiaceæ.	Euphorbiaceæ.
Myrsinaceæ.	Convolvulaceæ.	Aristolochiaceæ.
Sapotaceæ.	Boraginaceæ.	Piperaceæ.

Piperaceæ have been planted in a thatched shed, as is practised by the natives of Bengal and other dry parts of India, and under this shelter are growing all the numerous varieties of Betel cultivated in Bengal, and also several wild species. The collection of Palms, consisting of about eighty species, has been rearranged, by bringing together, as far as was possible, all the different species scattered throughout the garden. Many large specimens brought from distant parts of the garden have been successfully planted in this group, which is now in a very satisfactory state, and will, in a few years, be one of the most striking features of the garden.

The collection of Orchids has been more than doubled in number during the past year, and is now a very extensive and valuable one. It has been placed in two of the thatched conservatories lately erected by the Public Works Department in lieu of those destroyed by the cyclone, and the plants have been arranged in them by being suspended in baskets from the roof at different heights over rockworks covered with Ferns.

A garden was formed, in October last, on part of the land restored by the Agri-Horticultural Society, for the cultivation of all the annual

indigenous Indian plants and small perennial plants. Nearly 1000 species are now illustrated in this garden. They are arranged in linear beds, according to the natural system. The beds are six feet wide, and are divided by grassed footpaths. On the remaining portion of this land endogenous plants have begun to be arranged in circular groups, but I am unable to complete the illustration of this class of plants, or that of scandent species, for want of ground, and application will shortly be made for more of the Botanical Garden land in possession of the Horticultural Society. This new garden has already proved of great benefit to the seed department, as the seeds of the annual species cultivated in a small space of ground like this and carefully labelled, are collected with little difficulty.

An avenue of Mahogany has been formed along the road, parallel to the western boundary of the garden, leading southwards from the great Banyan-tree. This avenue consists of seedlings raised from seeds received from Trinidad, in July, 1865, and from seeds collected from the old trees in the Botanical Gardens in 1864. It is deserving of notice, that none of the Mahogany-trees produced any seed in 1865–66, although the trees blossomed in August and September, 1865. I ascribe this to the exhaustion of the trees by the unnatural production of leaves after the cyclone in October, 1864, and again at the natural period in the end of March, 1865. Another avenue has been planted along the road leading from the great Banyan-tree to the old tree of *Ficus venosa* which stands in the centre of the road leading to the Howrah gate, and is formed of *Polyalthia longifolia*. The Casuarina avenue extending from the *Ficus venosa* to the Howrah gate, and which was destroyed by the cyclone, has been replanted. A second avenue of Casuarinas has been planted along the semicircular roads running right and left from the main entrance ghât. In the palmetum, a very long avenue has been formed of the Palmyra Palm *Borassus flabelliformis,* and on the road which winds through the centre of the palmetum, has been made an avenue of the noble Cuban Palm *Oreodoxa regia*. The tree of this species, now sixty feet high, from which the seedlings for planting were obtained, was presented to the gardens by Lord Auckland when Governor-General. These and other avenues which I intend forming, will be most useful in protecting the garden from storms. I have been careful to record their formation, in order that in after years there may be no doubt about their age.

During the past year great success has attended the cultivation of the large Water-lily *Victoria regia*. Formerly the plant always died about the end of December, probably from the coldness of the water of the tank, the result of nocturnal radiation. In November last a screen of thin cloth was placed, which was drawn over the tank at night and removed during the day. The plant being protected in this way flowered profusely during the cold season and yielded a large quantity of seed.

During the year, the distribution and exchanges of plants with other Botanical Gardens have been vigorously sustained.

The total number of plants distributed from the garden during the past year is as follows:—

Dispatched in 25 Wardian cases and 6 closed boxes by steamer or sailing ships	830
Sent in 30 open boxes to residents in various parts of India	753
Distributed near Calcutta	1824
Total	3407

The total number of plants received, including Orchids, bulbous and tuberous plants, considerably exceeds 4000.

Distribution of Seeds.—Eighty-two packets of seed have been distributed throughout the year.

New species are continually being added to the list of seeds produced in the garden. The new edition of the seed catalogue published in the past year shows an increase since the first edition was drawn up of 500 species producing seed, notwithstanding the devastation of the garden by the cyclone.

The Herbarium.—The Herbarium was removed in January to the building prepared for it. The mounting of the specimens is steadily advancing. Additions have been made to the Herbarium by presentations from the Royal Herbarium at Kew, consisting principally of the series of Indian plants of the collections of my predecessors, Griffith and Falconer, of Dr. Helfer's Tenasserim plants, distributed by order of the Secretary of State, and of plants collected in Syria and Palestine in 1861.

From Mr. Teijsman, Director of the Botanical Garden, Buitenzorg, I have received specimens of certain special families of plants from his collections in Sumatra.

In April, I completed an enumeration of the Indian species of *Acanthaceæ*, which has been sent to London for publication. The Curator of the Herbarium has contributed to the 'Journal of Botany' and the Linnean Society's Proceedings, papers on the Synonymy of *Didymoplexis pallens*, Griff., a very rare and obscure Orchid found in lower Bengal; on the Asiatic species of *Lemnaceæ*, and Notes on the Indian *Bambusæ*.

[At the meeting of the Linnean Society, on November 1st, the paper on Indian *Acanthaceæ*, referred to by Dr. Anderson, was read. It was entitled an "Enumeration of the Species of Acanthaceæ of India, Ceylon, Burmah, and the Malayan Peninsula." The author having revised the African and most of the Asiatic genera, though hesitating to decide on the limits and affinities of the genera until the American species have also been examined, nevertheless is of opinion that the limits of the Asiatic genera, and of the larger groups, such as suborders and tribes, will not be materially altered when the entire Order comes to be revised. The views he has adopted concerning the limits and relations of genera, and the grouping them into tribes and suborders, are essentially different from those of Nees von Esenbeck, whose division of the group into two suborders, by the nature of the placental processes of the seeds, he regards as exceedingly unequal. In the arrangement he himself proposes, the suborder *Thunbergideæ* is separated from *Ruellideæ* and *Acanthideæ* by the nature of the calyx, the æstivation of the corolla, and the peculiar processes which support the seeds; while the *Ruellideæ* and *Acanthideæ*, almost co-extensive with Nees's great group of *Echmatacantheæ*, are readily distinguished from each other by the æstivation of the corolla, which is strongly contorted in the first and imbricated in the second. In *Ruellideæ* the tribes are established on characters taken principally from the calyx and form of the seed; in *Acanthideæ* they are easily distinguished by the form of the corolla, the number of stamens, and the condition of the anthers. The long paper consisted chiefly of a technical account of the species.—Ed.]

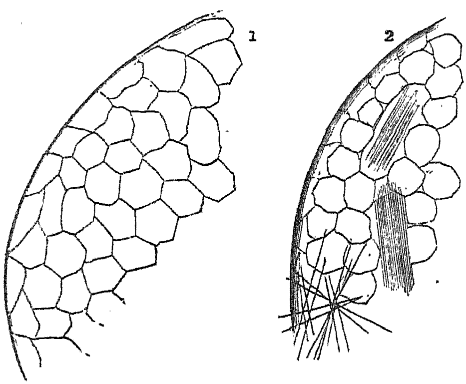
ON THE FROND-CELLS OF LEMNA AND WOLFFIA.

By George Gulliver, F.R.S.

My researches,—epitomized in the 'Popular Science Review,' Oct.

1865, and 'Quarterly Journal of Microscopical Science,' Jan. 1866,—have shown the great value of the anatomy and physiology of the cells as diagnostic characters in allied Orders, and even species, of all the different classes of flowering plants and some Ferns; while, among numberless other proofs that raphis-bearing is a constant and intrinsic character of the cell-life of certain plants, I have, as concerns our British Duckweeds, been for years insisting on the regular richness of some species and penury of others in raphides, although the plants thus differing grow close together under the very same conditions.

And now a still more remarkable difference appears between *Wolffia arrhiza* and *Lemna minor;* for while, as I have long since shown (Ann. Nat. Hist., May, 1861), this *Lemna* is one of the species in which raphides most abound, they cannot be detected at all in the *Wolffia,* as may be easily witnessed, either in thin horizontal sections of the fronds, or in fragments thereof detached by needles. As this curious diagnostic has not, I believe, been described or figured, a sketch of the mere outlines is now prepared for Dr. Seemann's 'Journal of Botany;' and this chiefly to show the fitness of extending similar observations to all the allied species.



1. Parenchyma-cells of *Wolffia arrhiza.*
2. Parenchyma-cells and bundles of raphides of *Lemna minor.*

Further examinations should also be made of *Wolffia arrhiza,* now an easy task, since the interesting addition, by Dr. Trimen, of this plant to the British Flora, *ante,* p. 219; and such inquiry is the more

needful, as my dissections have been limited to three fronds of this *Wolffia* presented to me through the courtesy of a friend.

I had made drawings of the stomata and cells of the epidermis of these Duckweeds, which are not engraved here, as I have since learned that they have been given by Hoffmann.

The root-sheaths of the Duckweeds may afford good characters. In *Lemna polyrrhiza* the tip of the sheath is sharp, while in *L. gibba* and *L. minor* it is blunt, as noticed by me in the 'Annals of Natural History,' May 1861. It may now be added, that the root-sheath of *L. trisulca* is curved and sharp-pointed. Of all these root-sheaths I trust to give a figure in a future number.

A NEW VARIETY OF *ANDROMEDA POLIFOLIA*.

By Ralph Tate.

Professor C. C. Babington, in his 'Manual of British Botany,' page 214 (1862), writes of *Andromeda polifolia*; "peduncles two or three times as long as the flowers," and 'not as in E. B.' Now, in the 'English Botany,' pl. 713, the peduncle is represented only equal in length with the flower, and Professor Babington's statement on this figure implies that the length of the peduncle is there erroneously represented. The accuracy of Sowerby's figure being called in question, led me to examine carefully the plant when first I became acquainted with it, which was a few years since, in the North of Ireland, where I have only met with the species. The numerous specimens of *Andromeda polifolia*, from the Cotton Moss, co. Down, that I have examined, agreed with Sowerby's figure, the peduncle being as long as or but slightly exceeding the flower; not a single exception to this came under my notice. Specimens, far advanced in maturity, from Wolf Island Bay, co. Antrim, have the proportionate length of flower and peduncle as about 2 to 3.

The peduncle of *Andromeda polifolia*, in the 'Flora Lapponica,' is represented as about three times the length of the flower, from which it would appear that Professor Babington's description agrees with the typical plant. Clearly, then, the specimen figured by Sowerby and those gathered by me in Ireland present a slight departure from the type—in the persistent (?) comparatively short peduncle, the length of which about equals that of the flower.

I propose the varietal name *curta* for this state of *A. polifolia*, and from not being in a position to pursue this investigation, I have here directed attention to it, trusting that some botanists will be induced to examine the species still further, and to ascertain whether the variation is constant or whether the extremes of length of the peduncle insensibly graduate one to the other, and if the former be true, whether other differential characters appertain to the variety.

ON A REGULAR DIMEROUS FLOWER OF *CYPRIPEDIUM CANDIDUM.*

By Asa Gray.

Mr. J. A. Paine, Jun., of New York, who, two years ago, detected an interesting monstrosity of *Pogonia ophioglossoides*, has now brought to me, preserved in spirit, a monstrous blossom of *Cypripedium candidum*, which demands a record.

The plant bears two flowers; the axillary one is normal, the terminal one exhibits the following peculiarities:—the lower part of the bract forms a sheath which encloses the ovary; the labellum is wanting; and there are two sterile stamens, the supernumerary one being opposite the other, *i.e.* on the side of the style where the labellum belongs. Accordingly, the first impression would be that the labellum is here transformed into a sterile stamen. The latter, however, agrees with the normal sterile stamen in its insertion as well as in shape, being equally adnate to the base of the style. Moreover, the anteposed sepal is exactly like the other, has a good midrib and an entire point. As the two sterile stamens are anteposed to the two sepals, so are the two fertile stamens to the two petals, and the latter are adnate to the style a little higher than the former. The style is longer than usual, is straight and erect; the broad, disciform stigma, therefore, faces upwards; it is oval and symmetrical, and a light groove across its middle shows it to be dimerous. The placentæ, accordingly, are only two. The groove on the stigma and the placentæ are in line with the fertile stamens.

Here, therefore, is a symmetrical and complete, regular, but dimerous orchideous flower, the first verticil of stamens not antheriferous, the second antheriferous, the carpels alternate with these; and here we

have clear (and perhaps the first direct) demonstration that the orchideous type of flower has two stamineal verticils, as Brown always insisted.—*From the American Journal of Science, xlii. July*, 1866.

NEW PUBLICATIONS.

A New Arrangement of Phanerogamous Plants, with especial reference to Relative Position, including their Relations with the Cryptogams. By BENJAMIN CLARKE, F.L.S. and M.R.C.S. London: sold by the Author, 2, Mount Vernon, Hampstead. 1866. Oblong folio, pp. 56.

This volume is the result of many years' study, and the examination of a large series of specimens; and although we cannot always, perhaps not even often, agree with the author in his conclusions, and in the novel groupings of the Natural Orders which he proposes, we must yet give him credit for having performed good service to botanical science, and having made observations and hinted at affinities that will be suggestive to future systematists. The purpose of the author is to discover affinities in plants irrespective of the absence or structure of the floral envelope, and of the relation of the stamens and pistil to it. These points, which are held of so much value in systematic botany, he considers of little importance, except in the Epigynous division of the Exogens, and he holds this structure to be so important here that he completely detaches the Epigynous families as a distinct division of the class Exogens, his conviction being "that the Epigynous division will prove to be as really distinct from the great mass of Exogens as the Endogens are from Exogens."

In drawing out his "New Arrangement," he starts with the belief that the Monopetalæ afford peculiar facilities, and no real difficulties, for arranging them according to their natural affinities; and having determined what that arrangement is with regard to them, he places the different sections of the Polypetalæ beside those Monopetalous families, of which he considers them to be the Polypetalous representatives; and then the Apetalæ are also fitted in as Apetalous representatives. Descending to the *Cryptogamia*, Mr. Clarke finds affinities among the higher members of this division of the vegetable kingdom sufficient to warrant his placing them in one of the groups he has established. He

regards "the *Fungales* and *Lichenales* as having no representatives among Phanerogamous plants, like the higher Cryptogams, and even the *Algales* remotely," and accordingly in his system he places them in a separate position at the commencement of the sections of Cryptogams. The method by which he traces affinities will be more apparent to our readers, if we give a specimen in the author's own words. He thus explains the relation of the Mosses to some of the other members of his Balanophoral division, at p. 13:—

"That the Epigynous Exogens, or, as I have termed them, the Balanophoral division, are really related to the *Bryaceæ*, may, I believe, be assumed, because the involucre (perianth) of *Jungermanniaceæ* may be regarded as analogous to the involucre so remarkable in the Epigynous families, especially in *Chamælauciaceæ*, *Calyceraceæ*, and *Dipsacaceæ;* the dense inflorescence of some *Bryaceæ* (50 archegonia on one stem) may be a near approach to the densely-crowded spikes of *Balanophoraceæ*. A further comparison is offered in the close resemblance in appearance between the paraphyses of the former, and the paraphysiform filaments occurring in the inflorescence of *Helosidæ* and other sections of the latter; and it may also be confidently anticipated that *Bryaceæ* will agree with *Balanophoraceæ* in the physiological character of parasitism (*vide* Linn. Proc. vol. v. p. 50). It appears to me not improbable that the calyptra is a carpel, and if so, may not the theca be a polyembryonous seed, its operculum an embryotega, and its inversion a tendency to become anatropous, as in the *Coniferæ?* And although the theca, as thus understood, represents an ovule, yet, as it has internally the structure of an anther, as far as regards the production of spores (like the ovules of *Passiflora* when producing pollen), the occurrence of a columella in the anther of *Mysodendron punctulatum* may be a very singular coincidence in structure between *Loranthaceæ* and *Bryaceæ*, and offer an unexpected explanation of the origin and nature of the columella in the latter hitherto obscure or unknown. The seta may be analogous to the jointed filament of *Melastomaceæ*, the articulation in the former being generally at its base, but not always (*Sphagnum*) instead of towards the apex; and the peristome to a tuft of scales on the apex of the half-superior ovary of *Centradenia*."

He proposes to arrange the vegetable kingdom in the following six great divisions:—1st. The Endogens, or race of the *Ricciaceæ;* 2nd. The Balanophoral or Epigynous division, or the race of the *Bryaceæ;* 3rd. The Chloranthal or Corolline Scale division, or the race of the *Lycopodiaceæ;* 4th. The Ceratophyllinal or Dorsal Placentation division, or the race of the *Marsileaceæ;* 5th. The Casuarinal or Amentaceous division, or the race of the *Marattiaceæ;* and 6th. The Platano-proteal or Labiatifloral division, or the race of the *Platanaceæ*.

In the six tables appended to his volume Mr. Clarke exhibits at one view the relations of the different families of each of these great divisions, and in the seventh table he brings together the divisions of the Exogens comprised in Tables 2 to 6, and so arranges them as to show their lateral relations to each other in their Monopetalous, Polypetalous, Apetalous, and Gymnospermous forms.

We cannot venture on criticism in detail of Mr. Clarke's views. There is in the volume so much novelty, and so much also from which, as we have hinted, we would be obliged to dissent, that we cannot here afford the space for such an investigation. We would recommend our readers interested in such studies to peruse the volume itself, being satisfied that however much they may differ from the author, they will find matter for thought, and numerous important original observations scattered throughout the volume.

Flora of Devon and Cornwall. By Isaiah W. N. Keys. Reprinted from the 'Annual Report and Transactions of the Plymouth Institution, and Devon and Cornwall Natural History Society, 1865–66.' Plymouth, 1866. *Ranunculaceæ* to *Geraniaceæ*.

This part contains the first 14 Orders of Professor Babington's 'Manual,' according to which work the Flora is arranged, and comprehends the names and localities of 205 species, native and naturalized; numerous varieties are also enumerated.

As the present is the first attempt at an entire Flora of this most interesting part of the kingdom, it can perhaps be scarcely expected to be complete; yet we cannot but feel somewhat disappointed that the author has not endeavoured to supply a more exhaustive and accurate catalogue, and one more equal to the recently published county Floras. It is not pleasant to find fault with a work of this kind, but it must be said that the time has gone by when a short list of localities "sufficient . . . to meet the requirements of students and collectors" is considered all that is necessary to form a local Flora. Later efforts of the kind have been directed towards endeavouring to accurately show the past and present state of the vegetation of the county or district of which they treat, and to attempt in some way to account for it; and in furtherance of this idea the district has been divided into smaller divisions, more or less numerous, founded in the best Floras on the natural

drainage of the country, and taking also into account soil and elevation. By this plan, not only have scientific results of an unexpected kind frequently accrued, but also practical convenience has resulted; instead of vague generalities, such as that a plant "is very common," or "frequent," it can be definitely stated that it has been found in so many and such districts, in such a number of places in one, only occasionally in another, and that it is unrecorded from a third; moreover localities are more easily arranged, and made available for use. The only attempt of this kind in the book before us is the use of the initials D. and C. for Devon and Cornwall respectively, and even their utility is much destroyed by their being placed after the localities instead of prefixed to them.

Moreover, in elucidating the vegetation of a county or other district, it is of importance scientifically that not only its present, but its past Flora be shown. For this purpose the works of the older botanists should be consulted, and their plants carefully determined; no one who has not worked with their books can know the accuracy or value of their observations. Mr. Keys has done nothing of this sort systematically for his Flora; not even all the more modern books have been quoted throughout. No doubt the amount of matter relating to the Flora of Devon and Cornwall is very large and much scattered, and its complete collation a work of no small labour; yet this must be done, if these counties are to have an exhaustive treatise on their native plants, to which great work the present Flora can be only considered as a prodromus.

In a county or district Flora, everything should bear strictly on that county or district; *e.g.* the general habitat, time of flowering, etc. should apply to the plant *as a plant of the district treated of.* Even the figures quoted should, when possible, be figures of plants gathered in the district. All these matters give a real practical value to the Flora as an exposition of the vegetation of the part. We are led to these remarks by what we must consider a defect in the book before us: the marks used to indicate spontaneous growth or naturalization, instead of applying to Devon and Cornwall are simply copied from the 'Manual,' in which, of course, they refer to the whole of Great Britain. Hence they are worse than useless, for it results that such alpine or subalpine plants as *Trollius Europæus*, *Arabis petræa*, and *Silene acaulis*, are entered without a bracket; and others, such as *Draba muralis*, *Thlaspi*

alpestre, *Lepidium latifolium*, and *Frankenia lævis*, though stated to be introductions or unsatisfactory natives, have no "star" or "dagger" to intimate as much. This is as if a writer should employ, in a Flora of Britain, signs used to express nativity or introduction in a work relating to the plants of the whole of Europe.

Notwithstanding these defects, the Devon and Cornwall Flora will, no doubt, be a very useful guide to the botany of those counties. This first part has been most carefully compiled; there are no misprints or errors of quotation, and the authorities for the localities are given at full length, instead of being merely indicated by initials, a very great practical convenience. Many of Mr. Ravenshaw's blunders and inaccuracies, too, have been corrected, as, for instance, the Devon locality for *Ranunculus gramineus*. Mr. Ravenshaw seemed to admit plants into his list on very insufficient grounds, and we would especially warn Mr. Keys against quoting too freely some of the Torquay localities, standing there vouched for by the initials C. E. P. The authentic specimens in the herbarium of the Torquay Natural History Society have been wrongly named in numerous instances, and should have been carefully looked through before C. E. P.'s localities were quoted. Perhaps it would be a better plan for Mr. Keys to authenticate localities from Mr. Ravenshaw's list with the original initials, than merely to affix "Rav." to them all.

Mr. Stewart's 'Flora of Torquay' (1860), does not seem to have been consulted, nor has that interesting little book, 'Jones's Botanical Tour through Devon and Cornwall' (1820), been systematically quoted, though it is once or twice referred to.

The writer of this notice can add two plants to Mr. Keys's list—*Fumaria muralis* (Sond.) which is not uncommon about Torquay, and *Arenaria leptoclados* (Guss.), which certainly occurs on the sandy shore at Paignton, and probably in other places.

H. T.

Salices Europeæ. Recensuit et descripsit Dr. Fredericus Wimmer. Breslau, 1866. Pp. xcii., 286.

It is forty years since Dr. Wimmer began to publish his 'Flora Silesiæ,' and since that time he has devoted himself to botany, and especially to this extremely obscure and difficult genus, *Salix*. He

monographed the Silesian species in a valuable paper, translated by Henfrey in the first volume of his 'Botanical Gazette;' with Krause he has published two extensive Herbaria of European Salices, and now he gives the result of his long acquaintance with them in the volume before us.

It is fortunate that those genera from the examination of which most botanists shrink, are the favourite study of some individuals. *Hieracium* is the delight of Backhouse in Britain, and Schultz-Bipontinus on the Continent. Babington is in love with *Rubus*, and there are in Germany some equally ardent admirers of that generally hated genus. Baker takes *Rosa* under his especial care, and Déséglise is an active *confrère* across the Channel. Borrer was deeply learned in the *Salices*, and Wimmer has studied them during a long life. As long as botanists generally are disinclined to deal with such genera, it is to be hoped that there will always be individuals who, having devoted themselves to their exposition, will find sufficient charms to induce them to prosecute their labours.

The genus *Salix* presents peculiar difficulties to attaining a correct knowledge of it. "The unmeaning names of authors, their imperfect descriptions and figures, their slight and inaccurate characters, and the vast number of species; their numerous and nameless varieties, and the different phases belonging to the different sexes of each species, conspire to render it the most difficult and inexplicable genus in the vegetable system." So wrote Dr. Walker, Professor of Natural History in Edinburgh University, seventy years since; in almost similar terms did Mr. Borrer express himself some years ago, after his study of the genus, and equally true are those words at the present day. Dr. Walker, one of the most philosophic naturalists of his day, the *master* of Robert Brown and of Jameson, studied this genus. His literary executors, some years after his death, published a volume of 'Essays on Natural History,' which contained part of a complete review of the genus. As far as it goes, it is a model monograph, but unfortunately the remainder, which was promised in a subsequent volume, was never published. Notwithstanding the careful and precise specific diagnoses, the essay has, we may say, been entirely overlooked. It deserves to be remembered, and we trust that future students of the genus will not forget Dr. Walker's 'Salicetum.' We should like to know the synonymy of some of the species he there describes.

We have examined Dr. Wimmer's volume chiefly with the view of finding what light he throws on our British species. It is curious to trace their history in our British Floras. Ray, in his first edition (1690) distinguishes 14 species; this number is raised to 22 by Dillenius, in the third edition of the 'Synopsis" (1724). Hudson reduces them to 16 (1778), and Withering returns to Dillenius's number (1787). Smith, in his 'Flora Britannica,' enumerates 45, in his 'English Flora,' 64; and there are no less than 76 different forms figured in 'English Botany.' Lindley, following Koch, brings them down to 29; Babington makes them 31; Hooker and Arnott, 38; and Bentham 15, being one more than the number Ray described nearly 180 years ago.

Wimmer considers that we have 19 true species, besides several distinct and distinguishable varieties. But before giving an epitome of his conclusions in regard to British species, we must express our regret that the author knows nothing of what has been done by Leefe, Borrer, and others, and that the 'Flora Britannica' (1800) is the latest British Flora with which he is acquainted. Any more recent information is obtained from Forbes's 'Salictum Woburnense,' a work of little critical value. This necessarily detracts from the value of the work to British botanists.

The following nineteen species, enumerated in the order of Babington's 'Manual,' he considers good:—

1. S. pentandra, *L.*
3. S. fragilis, *L.*
4. S. alba, *L.*
6. S. triandra, *L.*
7. S. acutifolia, *Willd.* = S. pruinosa, *Wendl.*
8. S. purpurea, *L.*
10. S. viminalis, *L.*
14. S. cinerea, *L.*
15. S. aurita, *L.*
16. S. Caprea, *L.*
17. S. nigricans, *Sm.*
19. S. phylicifolia, *L.* = S. Weigeliana, *Willd.*
23. S. repens, *L.*
25. S. Arbuscula, *L.*
26. S. Lapponum, *L.*
27. S. lanata, *L.*
28. S. Myrsinites, *L.*
30. S. reticulata, *L.*
31. S. herbacea, *L.*

One species he makes a synonym of one of the above, viz.:—

21. S. angustifolia, *Wulf?* = S. repens, *L.*

And the following species he reduces to hybrid forms, some of which

are, we doubt not, rightly referred, but others, if hybrids, certainly owe their origin to different species than those indicated :—

2. S. cuspidata, *Schultz* = S. pentandra-fragilis, *Wimm.*
5. S. undulata, *Ehrh.* = S. triandra-alba ♀, *Wimm.*
9. S. rubra, *Huds.* = S. viminalis-purpurea, *Wimm.*
11. S. stipularis, *Sm.* = ?
12. S. Smithiana, *Willd.* = S. caprea-viminalis, *Wimm.*
13. S. acuminata, *Sm.* = { S. longifolia-caprea? / S. longifolia-cinerea. } = S. calodendron ♀, *Wimm.*
18. S. laurina, *Sm.* = S. caprea-Weigeliana ♀, *Wimm.*
20. S. rosmarinifolia, *L.* = S. viminalis-repens, *Lasch.*
22. S. Doniana, *Sm.* = S. repens-purpurea, *Wimm.*
24. S. ambigua, *Ehrh.* = S. aurita-repens, *Wimm.*
29. S. procumbens, *Forbes* = ? Perhaps of *S. Myrsinites.*

The following recognized varieties he also reduces to *hybrid* forms :—

3. S. fragilis, *L.*, γ, S. Russelliana, *Sm.* = S. fragilis-alba, *Wimm.*
8. S. purpurea, *L.*, ϵ, S. Helix, *L.* = S. viminalis-purpurea, *Wimm.*
14. S. cinerea, *L.*, β, S. aquatica, *Sm.* = S. caprea-cinerea, *Wimm.*
18. S. laurina, *Sm.*, β, S. tenuifolia, *L.* = S. hastata-Weigeliana ♀, *Wimm.*
19. S. phylicifolia, β, S. tetrapla, *Walk.* = S. nigricans-Weigeliana, *Wimm.*

Fungi Britannici Exsiccati. A M. C. COOKE Collecti. Cent. 2. London: Hardwicke. 1866.

British mycologists will welcome this second fasciculus of British Fungi. Like the former, it consists almost entirely of epiphytal species, and among them we notice several that are of interest even to those who have long studied this curious set of plants. There are three species new to science,—*Venturia Myrtilli*, *Sphærella inæqualis*, and *S. Vaccinii;* several are new to Britain, such as *Æcidium Orchidearum*, *Puccinium Asari*, *P. difformis*, and *Sphærella myriadea;* while others are very rare species, thus, *Puccinium Campanulæ* has not been noticed since Carmichael found it; *P. Calthæ*, *Torrubia entomorrhiza*, *Septoria Ledi*, and many others might be characterized as rare. There is a curious specimen of what is believed to be *Macrosporium Cheiranthi* on a leaf of *Beta vulgaris;* we should have thought this sufficient to establish it as a new species, for the practice generally has been to make as many species of *Puccinium*, or any other epiphytal Fungus, as there are species on which they grow. We hope there is

here the dawn of a better appreciation of species than we have known in the past.

Prodromus Systematis Naturalis Regni Vegetabilis. Editore A. De Candolle. Pars XV., Sectio Posterior, Fasc. II., sistens Euphorbiæas. Auctore J. Müller, Argoviensi. Paris. 1866.

On receiving this work we ventured to characterize it as remarkable for the number of old synonyms which have been cleared up by the examination of authentic specimens, for the profound treatment of the subject, and the remarkable intelligence of the natural method shown by its author (*ante*, p. 304). Our continued examination confirms us in this judgment. Dr. Müller handles in a masterly manner this very large, obscure, and very difficult Order. Not only have the genera and species been in a state of great confusion, but even the position that the Order itself should occupy in the vegetable kingdom has been a subject of conflicting opinions. The apetalous character of the European representatives of the Order has too much influenced botanists in placing it among the Monochlamydeæ. This is the position it occupies in most Floras, and in all our British Manuals. In the Prodromus it is also placed among the apetalous Orders, apparently indicating that M. De Candolle takes this view of its position, although in his description of the Order we find these characters, "Corolla polypetala, vel rarissime gamopetala, vel nulla." In forming a true estimate of the relations of the Order, the polypetalous genera, which are the bulk of it, must be taken into account. If the apetalous structure of some genera, in other Orders, as *Ranunculaceæ*, is not sufficient to set aside the polypetalous character of the Order, we see no reason why it should have so much weight in *Euphorbiaceæ*. But this character of the presence or absence of a corolla is properly considered of no value in aberrant genera or even in aberrant suborders, else would we be obliged to break up many Natural Orders, and it would be difficult to say where we could stop, for, as Dr. Dickson has shown (Journ. of Bot. Vol. III. p. 209), from the development of the organs, those parts of the flower in some *Rosaceæ*, which every one invariably calls petals, are not petals at all, but stamens with petaloid apices. We would prefer placing the *Euphorbiaceæ* beside *Rhamnaceæ* or *Malvaceæ*, from which it differs chiefly in its unisexuality, rather than with *Urticaceæ*, with which it has much less in common.

But our purpose was to examine the part of the Prodromus just published, and not the position of the Order. Boissier had already monographed the *Euphorbieæ* in the first part of the volume; the remainder of the Order is here described by Dr. Müller, who assumes the distinctive designation Argoviensi, to distinguish him from the numerous Müllers who have devoted or are devoting themselves to botanical inquiries. Dr. Müller is a "lumper" of species; he has reduced many forms that were considered good species. He derives his specific diagnosis chiefly from the characters of the flowers, considering those of the leaves, etc., to be of less importance and of value only for distinguishing varieties. The volume consequently does not greatly increase the numbers of the *Euphorbiaceæ*, although it contains many new forms.

Dr. Müller introduces an innovation, which is to us very objectionable, and which we hope will not be perpetuated, as it will inevitably introduce endless confusion, impossible to be cleared up, into our already confused botanical nomenclature. Without altering the name, but because he includes forms that had before been excluded, he displaces the name of the author of the species, and attaches his own to it. Thus, *Mercurialis perennis* is not of L. but of Müll. Arg. Were this to be adopted, every "lumper" in reviewing a genus or family would be entitled to place his name after all the species, and, his "splitting" successor in the same work, giving a different value to his species, would also give us a complete change in the authors' names. We trust M. De Candolle will hesitate before he permits such a source of confusion a permanent admission to the Prodromus.

BOTANICAL NEWS.

George Heinrich Mettenius was born on the 24th of November, 1823, at Frankfort-on-the-Maine, where his father was a merchant. He attended the model school, and afterwards the school of Director Stellway, both at Frankfort, and subsequently became a pupil of the gymnasium of the same city, which he attended until 1841. In the spring of 1841 he went to the University of Heidelberg, devoting himself to the study of medicine. At Heidelberg he took, in July, 1845, the degree of Doctor of Medicine, his inaugural dissertation being *De Salvinià* (Francofurti ad M., 1845, 4to). In the spring of

the year 1846 he became a physician, but he never practised. In the autumn of 1846 he went to Heligoland, where he studied marine Algæ; the winter of 1846–47 was spent at Berlin; the summer of 1849 at Vienna, where he attended some of the medical lectures and the clinical classes of the hospitals; but specially devoted himself to botanical studies. In the autumn of 1847 he went to Dalmatia, and studied particularly the marine Algæ at Fiume. In the spring of 1848 he settled as "Privatdocent" of botany at the University of Heidelberg, where his public lectures were well attended. In the spring of 1851 he was called as Professor Extraordinary, in the place of Professor Alex. Braun, who had gone to Giessen, to the University of Freiburg, in Baden. There he remained only a year and a half. In the autumn of 1852 he was appointed Professor in Ordinary and Director of the Botanic Garden of Leipzig, where the chair of Botany had become vacant by the death of Professor Kunze. He married on June 14, 1859, Cecilia, the second daughter of Professor Alexander Braun [Professor Caspary having married the elder daughter of the same accomplished botanist on the same day].

At Leipzig Mettenius worked and studied up to the time of his death, which took place on August 18, 1866, from cholera. His last illness began at one o'clock in the morning. Being himself a physician, he soon felt that recovery was impossible, in spite of the exertions of two of the most eminent physicians of Leipzig. His mind, however, was clear enough to allow him to communicate to his wife his most important wishes as regarded his affairs. He died at six o'clock in the evening of the same day.

Mettenius was a very tall, athletic man, of great bodily strength. He led the most regular life possible. At five o'clock he began the work of the day, and finished it punctually at ten in the evening. His whole mind was turned towards the study of plants, and especially of Ferns, of which he found a very good living and dried collection in the garden at Leipzig, which had been brought together by Kunze. This he increased so greatly, that the Ferns of Leipzig are scarcely rivalled anywhere. Few directors of botanic gardens ever spent so much time and trouble in arranging the garden as Mettenius, for the inspector of the garden, Mr. Bernhardi, was in infirm health, so that Mettenius himself very generally took the whole management of the garden upon himself, being out by six o'clock in the morning and directing the operations of each of the labourers. He had a most intimate acquaintance with botanical literature, having great powers of reading, and he had formed an excellent library. His manners were retired and modest; he was devoted to his wife, and faithfully attached to his friends. He was one of those few persons upon whose word and deed entire reliance might be placed. He disliked to show off in public. His candid way of thinking, combined with a keen and penetrating judgment, may have caused him to appear, perhaps, sometimes stern and too severe, in the eyes of those of whom he had reason not to hold so favourable an opinion as others may have done. It is much to be regretted that the comprehensive work to which all his labours tended, viz. a 'Species Filicum,' studies for which he had made at nearly all the principal herbaria, as well as at Paris and Kew, has been left unfinished. Doubtless he had the most intimate knowledge

of Ferns of any one in our time. It is much to be wished that his excellent collection of dried Ferns may be added to that of Kunze, for public use at the University of Leipzig.

Mettenius left the botanic garden in Leipzig in such an excellent state, that it may serve as a pattern to any other.—*Professor Caspary in 'Gardners' Chronicle.'*

We append a list of the writings of Professor Mettenius, kindly supplied by Professor Caspary through Dr. Masters :—

1. De Salviniâ, Diss. Inaug.; Frankfort-a.-M., 1845, 4to. 2. Beiträge zur Entwickelungsgeschichte der beweglich. Thierinfusion von *Chara hispida;* Mohl et Schlechtendal, Botan. Zeitung, 1845, p. 17. 3. Beiträge zur Kenntniss der Rhizocarpeen; Frankfort-a.-M., 1846, 4to. 4. Ueber Azolla (in Linnæa, xx. 1847). 5. Beiträge zur Kenntniss der Botanik; Heidelberg, 1850, 8vo. 6. Filices Horti Botanici Lipsiensis; Leipzig, 1856, fol. 7. Filices Lechlerianæ Chilenses et Peruanæ; Leipzig, Fasc. i., 1857, 8vo. 8. Ueber einige Farngattungen (Abhandl. d. Senkenb. naturf. Ges.; Frankfort-a.-M., 1857–59); —I. Polypodium—II. Plagiogyria—III. Pteris—IV. Phegopteris and Aspidium —V. Cheilanthes—VI. Asplenium. 9. Beiträge zur Anatomie der Cycadeen (Abhdlg. d. Königl. Sächs. Gesellschaft d. Wissenchaft.; Bd. vii., Leipzig, 1860). 10. Ueber Seitenknospen bei Farnen (ibid., 1860). 11. Ueber den Bau von Angiopteris (ibid., ix., 1863). 12. Ueber die Hymenophyllaceæ (ibid., ix., 1864). 13. Filices Novæ Caledoniæ (Ann. Sc. Nat., ser. 4, vol. iv., 1861, p. 55. 14. Prodrom. Fl. Novæ Granatensis, par Triana et Planchon; Filices, auctore Mettenio, Ann. Sc. Nat. ser. 5, vol. ii., p. 193, 1864. 15. Filices præsertim Indicæ et Japonicæ, in Miquel Annales Mus. Bot. Lugd.-Bat., Fasc. ii., 1863; Fasc. vii. et viii., 1864. 16. *Azolla Nilotica,* Decaisne, in Kotschy Plantæ Finneanæ, 1866, fol.

The Rev. M. J. Berkeley described a new genus of Fungi at the last meeting of the Linnean Society, to which he gave the name of *Wynnea.* The specimens belonged all to a single species near to *Peziza leporina.* It is described as having a common stem three inches high and three-quarters of an inch thick, and is repeatedly divided upwards, its subdivisions being elongated into ear-shaped cups of two inches and a half to three inches long, smooth externally, but wrinkled within, having incurved margins variously divided, and being sometimes proliferous.

A LARGE TREE OF NICARAGUA.—Passing Nagarote, I measured a famous Genisaro-tree (*Pithecolobium Saman,* Benth.), of which the villagers are justly proud, and for which two hundred dollars have been offered, a high price in a country where timber abounds; and yet they had the public spirit, the rarest of virtues in a Spanish American, to refuse the offer,—others say the Government made them refuse. The tree is only 90 feet high; but some of the lower branches, which are quite horizontal, are 92 feet long and 5 feet in diameter. The stem, 4 feet above the base, is 21 feet in circumference; and the crown of the tree describes a circle of 348 feet. A whole regiment of soldiers may seek repose in its dense shade.—[B. SEEMANN in the 'Athenæum.']

BOTANICAL SOCIETY OF EDINBURGH.—Thirty-first Session. The Society met

on Thursday, 8th November, at 5, St. Andrew Square; Professor Balfour, Hon. Secretary, in the chair. The Chairman made some opening remarks, in which he referred to the death of Dr. Greville, the late President; of Dr. W. H. Harvey, Professor of Botany, Trinity College, Dublin, an Honorary Fellow of the Society, who died on the 15th May, 1866, at the age of fifty-five; of Jean François Camille Montagne, one of the foreign Honorary Fellows of the Society, a distinguished cryptogamic botanist, who died on 9th January, 1866, at the age of eighty-two; and of Diedrich Friedrich Ludovic von Schlechtendal, Professor of Botany and Director of the Botanic Garden at Halle, another foreign Honorary Fellow, who died on 12th October, 1866. It was stated that the following were the number of Members on the roll of the Society:—Royal personages, 2; Honorary Fellows (British), 5; Honorary Fellows (foreign), 23; resident Fellows, 94; non-resident Fellows, 268; foreign and corresponding Members, 96; Associates, 25; ladies, 11,—total, 524. The Chairman congratulated the Members on the continued prosperity of the Society, and alluded to the valuable papers which had been read during the last Session, and which are printed in the Transactions. The following communications were then read:—I. On Plants Collected at Otago, New Zealand. By Dr. W. Lauder Lindsay. 1. Fungi; 2. Mosses and *Hepaticæ;* 4. Ferns. In speaking of Tree-ferns, the author remarked that 6·81 per cent. of Otago Ferns were arborescent. These Tree-ferns rank, as regards beauty, and frequently as regards height, girth, and usefulness, with the exogenous forest-trees with which they are generally more or less intermixed. *Cyathea Smithii* is the most common species in Otago. *Dicksonia squarrosa* and *D. antarctica* are also marked Tree-ferns of the district. In the south island of New Zealand, Tree-ferns are associated with glaciers, snow, and other evidences of an alpine and rigorous climate. There are also found bordering on glaciers Fuchsia-trees and Cabbage-palms associated with *Araliaceæ*, *Myrtaceæ*, and other trees usually regarded as denizens of comparatively warm climates. The largest glacier, Mount Cook (13,000 feet, in lat. 43½°), which gives rise to the Wairau river, descends as low as 500 feet above the sea-level on the west coast of Canterbury, and within eight miles from the sea. On both sides of this glacier luxuriant forests of Tree-ferns, *Cordyline*, *Myrtaceæ*, and other temperate and subtropical types are found. At no great distance from these glaciers are found true Palms (*Areca sapida*). In the mountainous forests and ravines of Nelson, Tree-ferns ascend to 2000 feet. The acclimatization of New Zealand Ferns in Britain has been lately attracting the attention of horticulturists. Dr. Lindsay, however, doubts whether these plants will be hardy enough to stand the severest British winters without protection. The classification and nomenclature of New Zealand Ferns furnish us with some notable instances of the proneness to error in reference to climate, and the definition of genera, species, and varieties. Dr. Lindsay states that thirty species have been made out of *Ophioglossum vulgatum*, twenty different names are given to *Pteris aquilina* (the common Bracken), and about a dozen species have been manufactured out of *Lycopodium clavatum*. The variability of the species of New Zealand Ferns is remarkable. This was illustrated in species of *Asplenium*, *Lomaria*, *Aspidium*, *Hymeno-*

phyllum, etc.—II. On the *Selaginellas* cultivated in the Royal Botanic Garden, Edinburgh. By Dr. W. R. M'Nab. The author gave a revision of the *Selaginellas* cultivated in the Edinburgh Botanic Garden, the Royal Gardens, Kew, Messrs. Veitch and Sons' Nursery, Chelsea, and Messrs. Jackson and Sons' Nursery, Kingston, London. He pointed out the confusion that existed regarding the names of the different species, and gave a table of the synonyms. The species were arranged according to Professor Braun's 'Revisio Selaginellarum Hortensium,' and included forty-four species. Thirty-seven species had been carefully examined, but the author had not met with the other seven species included in Braun's list in cultivation in this country. The paper was illustrated by dried specimens from the different collections examined.—III. New Localities for Rare Plants round Edinburgh. By John Sadler. Mr. Sadler read extracts from various letters he had lately received, recording new localities for some rare plants in the neighbourhood of Edinburgh. 1. Mr. John K. Duncanson collected *Helminthia echioides*, between Charleston and Crombie Point; *Meum athamanticum*, farm of Pitdinnie, near Carneyhill; *Convallaria multiflora*, *Nymphæa alba*, *Nuphar lutea*, and *Potentilla fruticosa*, near Valleyfield; *Hesperis matronalis* and *Malva moschata*, south of Crossford; *Corallorhiza innata*, woods near Culross, abundant; *Lysimachia nummularia* and *Lamium maculatum*, near Dunfermline. 2. Mr. William Craig reported *Asplenium viride* from the South Medwyn, where he had met with it in considerable abundance in September last; also *Carduus heterophyllus*, and other species, from the same locality. 3. Mr. M'Farlan had gathered several plants of *Lathyrus Aphaca*, by the side of the Old Scone Road, about a mile from Perth. 4. Mr. John Sim intimated the discovery of *Sanguisorba Canadensis*, about a mile east of Perth. 5. Mr. P. N. Fraser reported *Allosorus crispus*, from Dunearn Hill. 6. Mr. Alexander Buchan sent specimens of *Centunculus minimus*, from Little Cumbrae. Specimens of the above plants were exhibited. Sir William Jardine, Bart., sent ripe specimens of the fruit of *Passiflora edulis*, *P. quadrangularis*, and *P. macrocarpa*, produced at Jardine Hall. They had been tested as articles of dessert, and pronounced to be good. Mr. Gorrie exhibited a ripe fruit of *Passiflora laurifolia*, or Water Lemon of the West Indies, grown and sent to him by P. L. Hinds, Esq., of The Lodge, Byfleet. In a a letter which accompanied it, Mr. Hinds remarks: "I have been rather amused to observe the inaccuracy of description handed down by various writers in regard to white spots on the orange-coloured fruit of this *Passiflora*." On this fruit, during a long lifetime, he has seen many thousands, and never detected a white spot on any one of them. With respect to *Passiflora macrocarpa*, he questions the statements made of its being a new fruit, being of opinion that it is neither more nor less than the true *P. quadrangularis*, with which he has been acquainted for upwards of sixty years, and is now freely producing it at his place from plants originally imported from the West Indian islands, and his fruit has varied from five pounds to nearly eight pounds each. What is known and grown in this country as *P. quadrangularis* is quite a different species, much smaller-fruited, and such as he has seen imported from Madeira. Mr. John Bisset, of Keith, sent specimens of *Brachypodium pin-*

natum, gathered by him at Craighalkie, Tomintoul, Banffshire, on limestone, in August, 1866. He also sent specimens of *Draba incana*, from Greywacke, at Boyndie, Banffshire, a few feet above the sea-level, gathered on 10th August, 1864, and also from schistose rock at Ailnathside, Glenavon, in the same county. These specimens exhibited considerable variations from those found in high alpine districts. Mr. William Cameron, schoolmaster, Balquhidder, sent a specimen of *Elatine hexandra*, gathered in Loch Voil. Mr. J. F. Duthil mentioned the occurrence of *Verbascum Lychnitis* on the Castle Rock, at Stirling.

A yellow-fruited variety of the Butcher's Broom (*Ruscus aculeatus*) has been gathered by Mr. Shortt in the woods at Heckfield.

We have to record the death of Professor Gasparini, of Naples, whose name is well known from his inquiries into many abstruse and difficult botanical subjects.

Dr. F. Schultz has just issued the ninth and tenth centuries of his 'Herbarium Normale.' Besides many established species, these two fascicles contains a considerable number of the species recently established by Jordan, Boreau, Mueller, etc.

ERRATA.—Mr. T. R. A. Briggs requests that the station (given at page 290) for *Mentha piperita*, var. β, Smith; *M. vulgaris*, Sole, t. 8, should be altered to "A damp spot by the roadside between Launceston and Bude, Cornwall."—The two reference letters attached to the first couple of characters in the artificial key to the Roses at page 302 should be transposed. The error in the text occurs in the original of Crépin, and its correction was overlooked in the transcription.

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END OF VOL. IV.

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